PATENT ABSTRACTS OF JAPAN

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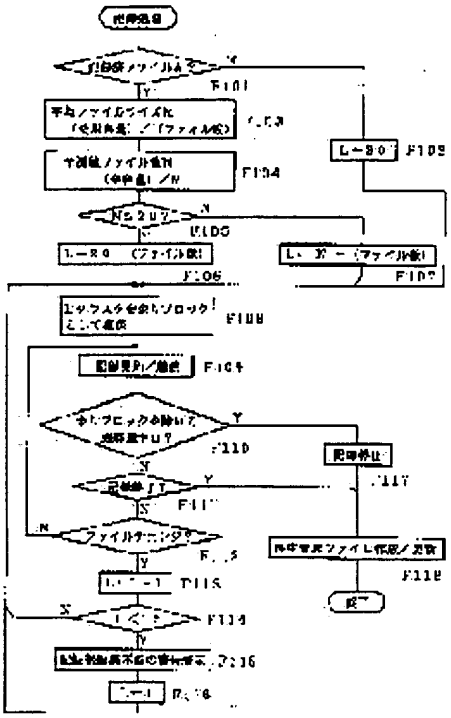
(54) RECORDING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To secure a state that recording or editing is made properly executable.

SOLUTION: The required amounts of surplus block are set at the time of a recording operation, and when residual recordable block amounts other than the surplus block amounts reach zero, a program recording operation is ended. After the recording of the program (contents) is ended, the recordable capacity equivalent to at least the surplus block amounts is left.



* NOTICES *

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3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1]A recorder comprising:
A program documentation means which blocks and records a program to a recording medium with which record is performed by a block unit.
While setting the amount of remainder blocks of requirements to a management information recording device which records management information which manages a recorded program on a recording medium, or updates it, A control means which will terminate recording operation by said program documentation means by recording operation by said program documentation means if a block residue in which said record excluding the amount of blocks not much is possible serves as zero on a recording medium.

[Claim 2]The recorder according to claim 1 characterized by said thing [setting up the amount of blocks not much] as a block used for record of management information according [said control means] to said management information recording device, or edit of a program updated and/or recorded.
[Claim 3]The recorder according to claim 1 characterized by said thing [setting up the amount of blocks not much] according to the number of programs currently recorded on a recording medium in the case of recording operation according [said control means] to said program documentation means.
[Claim 4]The recorder according to claim 1 characterized by said thing [setting up the amount of blocks not much] according to average data size of a program currently recorded on a recording medium, and capacity of a recording medium in the case of recording operation according [said control means] to said program documentation means.
[Claim 5]The recorder according to claim 1, wherein said control means outputs warning of editing processing about a program currently recorded on the recording medium being made

improper if a recordable block residue becomes below predetermined in a recording medium.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the recorder which records programs (contents), such as audio information and a video data, on a recording medium, for example.
[0002]
[Description of the Prior Art]The electrically rewritable nonvolatile memory called EEPROM (Electrically Erasable Programmable ROM), Since 1 bit was constituted from two transistors, the occupation area per bit was large and the limit was to make a degree of location high. In order to solve this problem, the flash memory which can realize 1 bit with one transistor with all the bit collective erasure methods was developed. The flash memory is expected as what can be replaced with recording media, such as a magnetic disk and an optical disc.
[0003]The memory card which constituted the flash memory to apparatus enabling free attachment and detachment is also known. If this memory card is used, record/playback equipment, such as digital audio information which change to disk like media, such as the conventional CD (compact disk) and MD (mini disc), and uses a memory card, are realizable.
[0004]And in the system which carries out record reproduction of the programs (it is also called contents), such as audio information and a video data, by using the memory card using a flash memory as a recording medium. For example, FAT (File Allocation Table) which is a file manager system conventionally used with a personal computer Edit of contents is easily attained by adopting a file system and the device of file management information. For example, if it assumes that the audio information as one musical piece is recorded as one contents, The DEBAIDO edit which divides the contents and is made into two contents, i.e., two music, the combine edit which is made to combine two contents conversely and is made into one contents, i.e., one music, etc. are possible. Thereby, in a user side, it also becomes possible to process arbitrarily the contents recorded on the memory card, and to enjoy them.
[0005]
[Problem(s) to be Solved by the Invention]By the way, it is considered as the system into which the contents as audio information can be edited conventionally, and the mini disc system is known. At this mini disc system, edit of contents has been realized by rewriting what is called TOC data that are the management information which manages contents. And on the mini disc (magneto-optical disc), the program area which records contents, and the management information field which records TOC data are set as according to by predetermined capacity, respectively, and the amount of information of TOC data did not affect the storage capacity of the program (contents). Since it all is [that rewriting of the TOC data in a management information field is only performed, and] even if it repeats edit how many times, this does not affect the storage capacity of a program (contents), either.
[0006]However, if writing is repeated in the same position when it is a flash memory, it is made

suitable from there being character in which a memory life is shortened remarkably to move a writing position continuously. For this reason, when the field which records contents in a memory card, and the field which records the management information which manages contents are not pinpointed, for example, it updates management information, new management information is written in a new field, and recording operation which eliminates the old management information is performed. This means that it is necessary to secure only the field which can newly write in ******** management information, when renewal of management information is needed in connection with the recording operation and edit operation of contents. If it puts in another way and there will be no availability more than predetermined, it will be in the state where it becomes what cannot perform renewal of management information, and recording operation is not completed by this, and edit is impossible. In the memory card which performs management of data, etc. by the prescribed unit called block, the amount of 1 block may newly be needed in the cases, such as DEBAIDO edit, for example. If this does not have an availability more than predetermined, either, it means that edit of contents cannot be performed.

[0007]That is, when using the memory card using a flash memory as a recording medium, When the remaining record possible capacity of a memory card becomes less than predetermined by record of contents, there is inconvenience of it becoming impossible to perform renewal of management information required after record and edit about contents currently recorded.

[0008]

[Means for Solving the Problem]An object in view of such a problem of this invention is for editing processing to enable it renewal of management information according to record of a program (contents), and to perform appropriately.

[0009]For this reason, a recorder of this invention receives a recording medium with which record is performed by a block unit, While setting the amount of remainder blocks of requirements to a program documentation means which blocks and records a program, and a management information recording device which records management information which manages a recorded program on a recording medium, or updates it, By recording operation by a program documentation means, if a recordable block residue except the amount of blocks serves as zero not much on a recording medium, it will have a control means which terminates recording operation by a program documentation means. That is, as a block used for record or updating of management information, and recorded edit of a program, the amount of blocks is set up not much, and recording operation of a program is ended, where capacity set up not much as an amount of blocks is left.

[0010]

[Embodiment of the Invention]Hereafter, the embodiment of the invention is described. According to this embodiment, the memory card which carries the nonvolatile memory (flash memory) as an example of a recording medium is mentioned, and the recorder which can perform record reproduction operation to a memory card as an example of a recorder is mentioned. Although the data as a program (contents) which can be treated in an embodiment has various kinds of things, such as video datas, such as audio information, a video data, and still picture data, text data, and program data, an explanation top shall treat audio information, such as a musical piece. in addition -- making pictures other than digital audio signals, a character, etc. into additional information, even when treating audio information as main contents -- record/-- it becomes refreshable. Explanation is given in the following order.

1. Composition 3. file system [Data file 4. recording processing 4-1 / Example 14-2 of processing / Example 24-3 of processing / Example 3 of processing] 3-1 of composition 2. memory card of recorder Treatment structure and data structure 3-2 directory configuration 3-3 Managing structure and edit method 3-4 Reproduction management file 3-5 [0011]1. The lineblock diagram 1 of a recorder explains the composition of the memory card recording and reproducing device (the following, recorder 1) which can carry out record reproduction of the programs (contents), such as audio information, to a memory card. The memory card which can be detached and attached freely

is used for this recorder 1 as a recording medium. And this recorder 1 may be constituted as audio equipment of a simple substance, and may be constituted as an apparatus part built in a personal computer, or an audio / visual apparatus. When you consider it as the audio equipment of a simple substance, let the recorder 1 be a recording and reproducing device of a deferred type or portable small size, for example. In that case, an audio system can also be constituted with an amplifier device, a loudspeaker, a CD player, an MD recorder, a tuner, etc. As a gestalt built in other apparatus, it is the same positioning as a CD-ROM drive or a floppy disk drive, for example in a personal computer, and can adopt as a memory card drive. It is also possible to build the recorder 1 in a video camera or a game machine machine furthermore, and to use a memory card as a recording medium of a video data or audio information. The recorder 1 is not concerned with the above-mentioned simple substance type and built-in, but can be applied also as a recorder which records the digital audio signals etc. which are distributed via data communications, digital broadcasting, the Internet, etc. which use a satellite.

[0012]Drawing 1 shows the general composition as a memory card recording and reproducing device realizable in the mode of these various kinds. The recorder 1 has the audio encoder / decoder IC10 which comprised a 1 chip IC, respectively, security IC20, and DSP(Digital Signal Processor) 30. And the memory card 40 which can be detached and attached freely is used as a recording medium to the recorder 1. The IC form of the security block with which the memory card 40 includes the enciphering circuit of a flash memory (nonvolatile memory), a memory control block, and DES (Data Encryption Standard) is carried out on 1 chip. In this example, although DSP30 is used, it may replace with DSP and a microcomputer may be used.

[0013]An audio encoder / decoder IC10 have the audio interface 11, and an encoder / decoder block 12. The data which carried out high efficiency coding of an encoder / the decoder block 12 in order to write digital audio signals in the memory card 40, and was read from the memory card 40 is decoded. As a highly efficient encoding method, what (it is written as ATRAC3) improved ATRAC (AdaptiveTransform Acoustic Coding) adopted with the mini disc can be used.

[0014]In ATRAC3, the audio information of 16 bits of one sample sampled at 44.1 kHz is processed. The minimum data unit when processing audio information by ATRAC3 is the sound unit SU. 1SU compresses a part for 1024 samples (1024x16 bits x two channels) into hundreds of bytes, makes it time, and is an about 23-m second. About 1/of audio information is compressed into 10 by ATRAC3. In a mini disc, there is little degradation of the tone quality according to compression/elongation processing by signal processing by which ATRAC3 was devised so that that may be right.

[0015]The line-in selector 13 supplies selectively the reproducing output of MD, the output of a tuner, and a tape reproduction output to A/D converter 14. A/D converter 14 changes the selected line-in signal into digital audio signals of (sampling frequency =44.1kHz and 1 sample =16 bit). The digital input selector 16 supplies selectively the digitized output of MD, CD, and CS (satellite digital broadcasting) to the digital input receiver 17. A digital input is transmitted, for example via an optical cable. The digital input receiver's 17 output is supplied to the sampling rate converter 15, and the sampling frequency of a digital input is changed into 44.1 kHz.

[0016]The coding data obtained by the encoding processing in the encoder / decoder block 12 of an audio encoder / decoder IC10 is supplied to the enciphering circuit 22 of DES via the interface 21 of security IC20. The enciphering circuit 22 of DES has FIFO23. It has for the enciphering circuit 22 of DES to protect the copyright of contents. Although mentioned later, the enciphering circuit of DES is included also in the memory card 40. The enciphering circuit 22 of DES of the recorder 1 has a unique storage key for every apparatus with two or more master keys. The enciphering circuit 22 of DES can have a random number generation circuit, and the memory card 40, the attestation, and the session key which build in the enciphering circuit of DES can be shared. The enciphering circuit 22 of DES can apply a key again by a storage key through the enciphering circuit of DES more nearly further.

[0017]The audio information enciphered from the enciphering circuit 22 of DES is supplied to DSP

(Digital Signal Processor) 30. DSP30 performs communication which passes the memory interface 38 shown in drawing 2 between the memory cards 40 with which the attachment-and-detachment mechanism which is not illustrated was equipped, and writes the enciphered data in a flash memory. Serial communication is made between DSP30 and the memory card 40. In order to secure memory space required for control of the memory card 40, external SRAM (Static Random AccessMemory) 31 is connected to DSP30.

[0018]The terminal 32 is connected and it enables it to perform two-way communication of contents data or control data between the external instrument or the external circuit unit which is not illustrated to DSP30 furthermore. DSP30 communicates between external instruments etc. via the interface 37 shown in drawing 2. For example, when this recorder 1 comprises a simple substance, The predetermined communication method should respond, for example to USB, IEEE1394, IEC958, serial port communication, parallel port communication, etc., and communication of the interface 37 and the terminal 32 is enabled between a personal computer, an audio / visual apparatus, etc.

[0019]When this recorder 1 is built in a personal computer, an audio / visual apparatus, etc., the interface 37 and the terminal 32 will take the composition of the internal bus etc. which are connected with the system controller of those apparatus, for example.

[0020]From the apparatus connected to the terminal 32, or a part, various kinds of data is supplied to DSP30. For example, when the recorder 1 is made into the part of an audio system or a computer system, From the system controller of the exterior which controls operation of the whole audio system and computer system, the data of sound recording instructions, a reproduction command, etc. by which it was generated according to a user's operation is given to DSP30. The data of additional information, such as picture information and text, is also supplied to DSP30 via the terminal 32. Furthermore, DSP30 can also supply additional information data, a control signal, etc. which were read from the memory card 40 to an external system controller via the terminal 32.

[0021]The final controlling element 39 in which the operation key etc. to which a user performs various kinds of operations were provided, and the indicator 33 which presents various kinds of information to a user are shown in drawing 1. Especially these are needed when the recorder 1 comprises a simple substance, and when the recorder 1 is built [for example,] in a personal computer, direct continuation of the final controlling element 39 and the indicator 33 does not have to be carried out to DSP30. That is, in the case of a simple substance, although DSP30 will perform processing of the operational input from the final controlling element 39, and display control in the indicator 33, In a built-in case, it is for what is necessary being just to receive the information for which the contents which perform these control, and should supply operation information to DSP30 or the system controller of the device should display on it from DSP30 if needed are shown.

[0022]The audio information enciphered by DSP30 as contents read from the memory card 40 is decrypted by security IC20, and receives the decoding processing of ATRAC3 by an audio encoder / decoder IC10. And the decryption output of an audio encoder / decoder 10 is supplied to D/A converter 18, and is changed into an analog audio signal. And an analog audio signal is taken out by the line-out terminal 19.

[0023]Line-out is transmitted to the amplifier device etc. which are not illustrated, and is reproduced by the loudspeaker or headphone. A muting signal is supplied from an external controller to D/A converter 18. When a muting signal shows one of muting, the audio output from the line-out terminal 19 is forbidden.

[0024]Although drawing 1 shows only the line-out terminal 19, of course, a digital output terminal, a headphone jack, etc. may be provided. The output of the contents data to an external instrument can also be performed via the terminal 32 as mentioned above.

[0025]Drawing 2 shows the internal configuration of DSP30. DSP30 comprises the core 34, the flash memory 35, SRAM36, the interface 37, the memory card interface 38, and a bridge between buses. This DSP30 functions as a microcomputer similarly and the core 34 is equivalent to CPU. The

program for processing of DSP30 is stored in the flash memory 35. SRAM36 and SRAM31 of the exterior are used as a work memory for various processing.

[0026]DSP30 answers manipulate signals (or manipulate signal inputted from the final controlling element 39 shown in drawing 1), such as sound recording instructions received via the interface 37. The processing which writes in the enciphered predetermined audio information and predetermined additional information data to the memory card 40, and reads these data from the memory card 40 is controlled. Namely, the application software of the whole audio system for performing record/reproduction of audio information and additional information, DSP30 is located between the memory cards 40 and DSP30 operates with software, such as access of the memory card 40, and a file system.

[0027]The FAT filesystem for which the file management on the memory card 40 in DSP30 is used with the existing personal computer is used. In addition to this file system, by this example, the reproduction management file of a data configuration which is mentioned later is used. A reproduction management file manages the data file currently recorded on the memory card 40. Namely, the reproduction management file as the 1st file management information, Managing the file of audio information, FAT as the 2nd file management information manages the whole file on the flash memory of the memory card 0 including the file and reproduction management file of audio information. A reproduction management file is recorded on the memory card 40. FAT is beforehand written in on the flash memory with the root directory etc. at the time of shipment.

[0028]In this example, in order to protect copyright, the audio information compressed by ATRAC3 is enciphered. It is kept from on the other hand enciphering noting that a management file has unnecessary copyright protection. There may be what has an enciphering function also as the memory card 40, and a thing which it does not have. It is only a memory card with an enciphering function which can use the recorder 1 which records the audio information which is works like this example.

[0029]2. The lineblock diagram 3 of a memory card shows the composition of the memory card 40. As for the memory card 40, the control block 41 and the flash memory 42 are constituted as a 1 chip IC. The bidirectional serial interface between DSP30 of the recorder 1 and the memory card 40 consists of ten lines. Four main lines are with the clock line SCK for transmitting a clock at the time of data communications, status-line SBS for transmitting status, and data-line DIO and interruption line INT that transmit data. In addition, as a line for current supply, two line GND and two VCC lines are formed. The two lines Reserv are lines of the undefined.

[0030]The clock line SCK is a line for transmitting the clock in sync with data. Status-line SBS is a line for transmitting the signal showing the status of the memory card 40. The data line DIO is a line for outputting and inputting a command and the enciphered audio information. Interruption line INT is a line which transmits the interrupt signal which requires interruption to DSP30 of the recorder 1 from the memory card 40. When it equips with the memory card 40, an interrupt signal occurs. However, in this example, since he is trying to transmit an interrupt signal via the data line DIO, interruption line INT has been grounded.

[0031]Serial/parallel conversion, parallel/serial conversion, and the interface block 43 of the control block 41 (it abbreviates to S/P, P/S, and IF block) are the interfaces of DSP30 of the recorder connected via two or more lines mentioned above, and the control block 41. S/P, P/S, and the IF block 43 change into parallel data the serial data received from DSP30 of the recorder 1, are incorporated into the control block 41, change the parallel data from the control block 41 into serial data, and send them to DSP30 of the recorder 1. S/P, P/S, and the IF block 43 separate a command and data, and the command and data required for encryption for the usual access to the flash memory 42, when the command and data which are transmitted via the data line DIO are received.

[0032]That is, in the format transmitted via the data line DIO, a command is transmitted first and data is transmitted after that. S/P, P/S, and the IF block 43 distinguish a command and data

required for a usual command and data required for access, and encryption, seeing the code of a command. According to this discriminated result, a command required for the usual access is stored in the command register 44, and data is stored in the page buffer 45 and the light register 46. The error correction code-ized circuit 47 is formed in relation to the light register 46. The error correction code-ized circuit 47 generates the redundancy code of an error correction code to the data temporarily stored in the page buffer 45.

[0033]The output data of the command register 44, the page buffer 45, the light register 46, and the error correction code-ized circuit 47 is supplied to a flash memory interface and the sequencer (it abbreviates to memory I/F and a sequencer) 51. Memory IF and the sequencer 51 are the interfaces of the control block 41 and the flash memory 42, and control an exchange of the data between both. Data is written in the flash memory 42 via memory IF and the sequencer 51.

[0034]The contents (it is written as the audio information compressed by ATRAC3 and following ATRAC3 data) written in the flash memory 42, For copyright protection, it is enciphered by security IC20 of the recorder 1, and the security block 52 of the memory card 40. The security block 52 is provided with the following.

Buffer memory 53.

The enciphering circuit 54 of DES.

Nonvolatile memory 55.

[0035]The security block 52 of the memory card 40 has a unique storage key for every memory card with two or more attestation keys. The nonvolatile memory 55 stores a key required for encryption, and is not visible from the outside. For example, a storage key is stored in the nonvolatile memory 55. It has a random number generation circuit, attestation is possible with the exclusive (meaning in the system with the same use of the existing data format etc. which were decided) recorder 1, and a session key can be shared. It can perform reapplying a key in a storage key through the enciphering circuit 54 of DES more nearly further.

[0036]For example, attestation is made when the recorder 1 is equipped with the memory card 40. Attestation is made by the security block 52 of security IC20 of the recorder 1, and the memory card 40. The recorder 1 will check that a partner is the person himself/herself mutually, if it admits that the memory card 40 with which it was equipped is the person himself/herself (memory card in the same system) and the memory card 40 admits that a partner's recorder is the person himself/herself (recorder in the same system). If attestation is performed, the recorder 1 and the memory card 40 will generate a session key, respectively, and a session key will be shared. A session key is generated by the degree of attestation.

[0037]And at the time of the writing of the contents to the memory card 40, the recorder 1 enciphers a contents key with a session key, and the memory card 40 is passed. In the memory card 40, a contents key is decoded with a session key, it enciphers by a storage key, and the recorder 1 is passed. A storage key is a key unique to each of the memory cards 40, and the recorder 1 will write the contents which performed format processing and were enciphered as the enciphered contents key in the memory card 40, if the enciphered contents key is received.

[0038]At the time of data read-out from the flash memory 42, the read data is supplied to the page buffer 45, the read register 48, and the error correction circuit 49 via memory IF and the sequencer 51. And the data memorized by the page buffer 45 is made for an error correction by the error correction circuit 49. The output of the page buffer 45 and the output of the read register 48 by which the error correction was carried out are supplied to S/P, P/S, and the IF block 43, and are supplied to DSP30 of the recorder 1 via the serial interface mentioned above.

[0039]At the time of such read-out, the contents enciphered with the contents key enciphered by the storage key and the block key are read from the flash memory 42. And by the security block 52, a contents key is decoded by a storage key. It is enciphered with a session key and the contents key furthermore decoded is transmitted to the recorder 1 side. The recorder 1 decodes a contents

key with the received session key. The recorder 1 generates a block key by the decoded contents key. With this block key, ATRAC3 enciphered data is decoded one by one.

[0040]The version information of the memory card 40, various kinds of attribution information, etc. are stored in configuration ROM50. The memory card 40 is equipped with the operational switch 60 for erroneous erasure prevention for the user if needed. When this switch 60 is in the connected state of the prohibition on elimination, even if the command which directs to eliminate the flash memory 42 is sent from the recorder side, elimination of the flash memory 42 is forbidden. The oscillator 61 generates the clock used as the timing basis of processing of the memory card 40.

[0041]3. File system 3-1 Treatment structure and the data structure diagram 4 show the file system processing hierarchy of the system which uses the memory card 40 as a storage. As a file system processing hierarchy, an application process layer is the top and a file management processing layer, a logical address management layer, a physical address management layer, and flash plate memory access set one by one to the bottom of it. In this layered structure, a file management processing layer is a FAT filesystem. The physical address was attached to each block of a flash memory, and the correspondence relation between a block and a physical address is eternal. A logical address is an address which a file management processing layer treats logically.

[0042]Drawing 5 shows an example of the physical configuration of the data of the flash memory 42 in the memory card 40. The data unit by which the flash memory 42 is called a segment is divided to the block (fixed length) of a predetermined number, and 1 block is divided to the page (fixed length) of a predetermined number. In the flash memory 42, it is carried out by elimination bundling up by a block unit, and writing and read-out are performed by bundling up per page.

[0043]Each block and each page are made into the respectively same size, and 1 block is constituted from the page 0 by the page m. It is considered, for example as an 8-KB (K byte) byte or the capacity of 16 KB, and let 1 page 1-block be the capacity of 512B. In the flash memory 42 whole, by the case of 1 block = 8 KB, it is referred to as 4 MB (512 blocks) and 8 MB (1024 blocks), and by the case of 1 block = 16 KB. It is considered as the capacity of 16 MB (1024 blocks), 32 MB (2048 blocks), and 64 MB (4096 blocks).

[0044]1 page consists of 512 bytes of data divisions, and 16 bytes of redundancy parts. Let 3 bytes of the head of a redundancy part be an over-writing portion rewritten according to renewal of data. Block status, page status, and updating status are recorded on 3 bytes of each byte sequentially from a head. 13 bytes of contents of the remainder of a redundancy part are considered as immobilization according to the contents of the data division in principle. These 13 bytes consist of a management flag (1 byte), a logical address (2 bytes), the fields (5 bytes) of format reserve, distributed information ECC (2 bytes), and data ECC (3 bytes). Distributed information ECC is redundant data for error corrections to a management flag, a logical address, and format reserve, and data ECC is redundant data for error corrections to 512 bytes of data.

[0045]As a management flag, it is a system flag (the value and). [1-:-user-] 0: Each flag of a boot block, a translation table flag (1: invalidity, 0:table block), copy prohibition specification (1:O.K., 0:NG), and an access permit (1:free, 0: lead protection) is recorded.

[0046]Two blocks 0 of the head in a segment, i.e., a block, and the block 1 are boot blocks. The block 1 is an object for backup to which the same data as the block 0 is written. A boot block is a leading block of the effective block in the memory card 40, and when apparatus is loaded with the memory card 40, it is a block accessed first. The remaining block is a user block. A header, a system entry, and boot & attribute information are stored in the page 0 of the head of a boot block. Disable block data is stored in the page 1. CIS (Card Information Structure)/IDI (Identify Drive Information) is stored in the page 2.

[0047]The number of entries effective [the header of a boot block] in boot block ID and a boot block is recorded. The starting position of disable block data, its data size, a data type, the data starting position of CIS/IDI, its data size, and a data type are recorded on a system entry. boot & attribute information -- the type (read-only.) of the memory card 40 The data (date of manufacture

etc.) relevant to manufacture of the card for whether they are block sizes, such as a hybrid of a lead and the light possibility of, and both types, the block count, the total block count, and security correspondence, etc. are recorded.

[0048]What is called a flash memory produces degradation of an insulator layer by rewriting data, and the number of times of rewriting is restricted. Therefore, it is necessary to prevent access from being repeatedly made intensively to a certain same storage area (block). Therefore, when rewriting the data of a certain logical address stored in a certain physical address, in the file system of a flash memory. It is made as [write / without carrying out writing in again the data updated to the same block / the data updated to the intact block]. As a result, it changes in after the correspondence relation between a logical address and a physical address before renewal of data updating. Access is prevented from being repeatedly carried out intensively by performing such processing (swap processing is called) to the same block, and it becomes possible to prolong the life of a flash memory.

[0049]Since the data once written in to the block is accompanied, even if the block with which the data before updating and the data after updating are written in moves, from FAT, the same address of a logical address can be seen and it can perform subsequent accesses properly. Since the correspondence relation between a logical address and a physical address changes with swap processings, the logic-physical address translation table showing both correspondence is needed. By referring to this table, access to the block which the physical address corresponding to the logical address specified by FAT is specified, and the specified physical address shows is attained.

[0050]A logic-physical address translation table is stored by DSP30 on SRAM 31 and 36. When there is little RAM capacity, it can store in the flash memory 42. This table is a table which made the physical address (2 bytes) correspond to the logical address (2 bytes) arranged in the ascending order roughly, respectively. Since the maximum capacity of the flash memory 42 is 128 MB (8192 blocks), 2 bytes can express the address of 8192. A logic-physical address translation table is managed for every segment, and the size becomes large according to the capacity of the flash memory 42. For example, in the case where the capacity of the flash memory 42 is 8 MB (two segments), 2 pages is used for logic-physical address translation tables to each of two segments. When a logic-physical address translation table is stored in the flash memory 42, it is directed by predetermined 1 bit of the management flag in the redundancy part of each page mentioned above whether the block concerned is the block with which the logic-physical address translation table is stored.

[0051]It is usable by the FAT filesystem of a personal computer like a disk shape recording medium in the memory card 40 mentioned above. Although not shown in drawing 5, an IPL field, a FAT area, and a root directory field are provided on the flash memory 42. The variety of information of the address with which the program which should be first loaded to the memory of the recorder 1 is written, and the memory is written to the IPL field. The related matters of the block (cluster) are written to the FAT area. The value which shows an intact block, the following block number and a defective block, and the last block, respectively is specified in FAT. Directory entries (a file attribute, an updating date, a start cluster, a file size, etc.) are written to the root directory field.

[0052]He is trying to have a playback management file for managing the part which constitutes each track and each track to the file for music separately from the file manager system specified in the format of the memory card 40 mentioned above in this example. This reproduction management file is recorded on the flash memory 42 using the user block of the memory card 40. By it, even if FAT on the memory card 40 breaks, it becomes restorable [a file].

[0053]This reproduction management file is created by DSP30. For example, attestation is performed, when it is judged whether it is equipped with the memory card 40 when one [a power supply] first and it is equipped with the memory card 40. If it is checked by attestation that it is a regular memory card, the boot block of the flash memory 42 will be read into DSP30. And a logic-physical address translation table is read. The read data is stored in SRAM 31 and 36. Also the

memory card 40 used only after a user purchases, FAT and the writing of the root directory are made by the flash memory 42 at the time of shipment. A playback management file will be created if sound recording is made.

[0054]That is, if the sound recording instructions generated by a user's operation etc. are given to DSP30, the audio information which received will be compressed by an encoder / decoder IC10, and ATRAC3 data from an encoder / decoder IC10 will be enciphered by security IC20. And although ATRAC3 data in which DSP30 was enciphered is recorded on the flash memory 42 of the memory card 40, FAT and a reproduction management file are updated after this record. The degree of renewal of a file, and whenever it starts record of audio information and specifically ends record, FAT and a reproduction management file are rewritten on SRAM31 and 36. And when removing the memory card 40, or when power is turned off, final FAT and a reproduction management file are stored on the flash memory 42 of the memory card 40 from SRAM 31 and 36. In this case, whenever it starts record of audio information and ends record, FAT and the reproduction management file on the flash memory 42 may be rewritten. Also when it edits, the contents of a reproduction management file are updated.

[0055]In the data configuration of this example, additional information is also created and updated in a reproduction management file, and it is recorded on the flash memory 42. Apart from a reproduction management file, an additional information management file may be made to be created. Additional information is given to DSP30 via a bus and the bus interface 32 from an external controller. The additional information which DSP30 received is recorded on the flash memory 42 of the memory card 40. Since it does not pass along security IC20, additional information is not enciphered. Additional information removes the memory card 40, or is written in the flash memory 42 from SRAM of DSP30 at the time of power OFF.

[0056]3-2 Directory configuration drawing 6 shows the directory configuration of the memory card 40. The directory for still pictures, the directory for animations, the directory for sounds, the directory for control, and the directory for music (HIFI) are formed from a root directory so that it may illustrate. By this example, since it explains focusing on musical record/playback, the directory for music is explained hereafter. Two kinds of files are put on the directory for music. One of them is reproduction management file PBLIST.MSF (it is only hereafter written as PBLIST), and other things consist of ATRAC3 data-file A3Dnnnn.MSA (it is only hereafter written as A3D nnn) which stored the enciphered music data. ATRAC3 data file is prescribed that the maximum number is to 400. After registering ATRAC3 data file into a reproduction management file, it is arbitrarily created by apparatus.

[0057]3-3 Managing structure and edit method drawing 7 show the composition of a reproduction management file, and drawing 8 shows the composition of one ATRAC3 data file (one music). A reproduction management file is a file of 16KB fixed length. As shown in drawing 7, a reproduction management file consists of additional information INF-S of the reproduction table TRKTBL of name NM1-S of the memory card of a header and a single byte code, name NM2-S of the memory card of a 2-byte code, and playing order, and the whole memory card.

[0058]ATRAC3 data file (only henceforth a data file) shown in drawing 8 is equivalent to the program (or contents) as used in the field of this invention, and is a file of a music unit. And a data file consists of a top attribute header and enciphered actual music data following it. An attribute header is made into 16-KB fixed length, and has a reproduction management file and similar composition. The attribute header of the head of a data file consists of track information TRKINF(s), such as track name NM2 of 1 or 2 bytes of track name NM code of a header and a single byte code, and key information on a track, part information PRTINF, and additional information INF of a track. The information on the total number of multipart forms, the attribute of a name, and the size of additional information, etc. are included in a header.

[0059]In this data file, the music data of ATRAC3 continues to an attribute header. Music data is divided for 16 KB of every block, and the header is added to the head of each block. The initial value

for decoding a code is included in a header. Only the music data in ATRAC3 data file receives processing of encryption, and the data of the other reproduction management file, a header, etc. is not enciphered.

[0060]With reference to drawing 9, the relation between music (contents) and ATRAC3 data file is explained. One contents mean the data constellation managed as one music. One music comprises one ATRAC3 data file (refer to drawing 8). The audio information into which ATRAC3 data file was compressed by ATRAC3 is recorded.

[0061]To the memory card 40, record of data is performed in the unit called a cluster. One cluster is 16 KB in capacity. Two or more files do not mix with this one cluster. The minimum unit when eliminating the flash memory 42 is 1 block. In the case of the memory card 40 used for recording music data, a block and a cluster are convertible terms and are defined as 1 cluster =1 sector.

[0062]Although one music comprises one part fundamentally, when edit is performed, one music may comprise two or more parts.A part means the unit of the data recorded by within a time [which continued from a recording start to the stop], and one contents usually comprise one part. When one contents comprise two or more parts, relation of the part in music is managed by part information PRTINF (after-mentioned) in the attribute header of each music. That is, 4 bytes of data called the part size PRTSIZE in PRTINF expresses part size. 2 bytes of the head of the part size PRTSIZE show the total of the cluster which a part has, and the next 1 byte each shows the position of the start sound unit (it is written as SU) in a head and the cluster of an end, and the position of the end SU. By having a describing method of such a part, when editing music data, it becomes possible to usually lose movement of a lot of music data needed. If it limits to edit of a block unit, movement of music data is avoidable similarly, but as compared with SU unit, the edit unit of a block unit is too large.

[0063]SU is the minimum unit of a part and is the minimum data unit when compressing audio information by ATRAC3. Hundreds of bytes of data which compressed into 10 about 1/of audio information for 1024 samples obtained by a 44.1-kHz sampling frequency (1024x16 bits x two channels) is SU. 1SU will be converted into time and will be an about 23-m second. Usually, one part is constituted by SU which attains to thousands. When one cluster comprises 42 SU(s), the sound for about 1 second can be expressed with one cluster. The number of the parts which constitute one contents is influenced by additional information size. Since it is decided by the number excluding a header, a track name, additional information data, etc. out of 1 block, the number of multipart forms serves as conditions for which the state where there is no additional information can use the part of the maximum number (645 pieces).

[0064]Drawing 9 shows the file organization at the time of recording two audio information from CD etc. continuously. The case where the 2nd (data file #2) music is constituted from six clusters (CL5-CL10) by drawing 9 (c) when the 1st (data file #1) music is constituted from five clusters (CL0-CL4) by drawing 9 (a) is shown. Since two files are not allowed to be intermingled in one cluster between the 2nd music with the 1st music, data file #2 is created from the beginning of the following cluster (CL5). Therefore, as the termination (termination of the 1st music) of data file #1 is a cluster, even if it is located, as expanded and shown in drawing 9 (b), data (SU) shall not exist in the remaining portion of the cluster. The 2nd music (data file #2) is the same. And in the case of this example, data file #1 and #2 comprise one part.

[0065]To the data file recorded on the memory card 40, DEBAIDO, a combine, erasion, and four kinds of processings of a move are specified as edit. DEBAIDO is dividing one track into two. If DEBAIDO is carried out, the total one track number will increase. DEBAIDO divides one file on a file system, considers it as two files, and updates a reproduction management file. A combine is combining two tracks with one. If a combine is carried out, the total one track number will decrease. A combine unifies two files on a file system, carries out them to one file, and updates a reproduction management file. Erasion is eliminating a track. One track number after being erased decreases. The move as editing processing is changing track turn. A reproduction management file is updated also in

this case. The "move" as editing processing here is not accompanied by movement of data. For example, a meaning differs from the "move" of the data from recording media, such as HDD, to recording media, such as a memory card. After the move from a recording medium to a recording medium copies data, it is realized by eliminating the data from the recording medium of a copied material.

[0066]The result of having carried out the combine of the two music (data file #1, #2) shown in drawing 9 is shown in drawing 10. By the combine having been carried out, data file #1 and #2 are set to one data file #1, and this data file #1 is formed from two parts. Since there is a describing method about a part in this example as mentioned above, the starting position of the part 1, the end position of the part 1, the starting position of the part 2, and the end position of the part 2 can be specified to the result (drawing 10) of having carried out the combine, per SU, respectively. As a result, in order to pack the crevice between the knots of the result which carried out the combine, it is not necessary to move the music data of the part 2.

[0067]Drawing 11 shows the result, DEBAIDO [one music (data file #1) of drawing 9 (a)] in the middle of the cluster 2. By DEBAIDO, data file #2 which consists of cluster CL3 and CL4 data file #1 which consists of a front side of cluster CL0, CL1, and cluster CL2, and the backside of cluster CL2 (CL11) occurs. Since two files are not allowed to be intermingled in one cluster as mentioned above, in the DEBAIDO edit which makes a division point a certain position in cluster CL2 in this way, it is first copied to cluster CL11 [another] in which the data of cluster CL2 has opened. And the position equivalent to the division point in cluster CL11 is made into the starting point, and it is made for cluster CL3 and CL4 to follow the cluster CL11 in data file #2. Therefore, in DEBAIDO edit, it is necessary to newly use not only the renewal of a reproduction management file but one cluster.

[0068]Since there is a describing method about a part as mentioned above, it is not necessary to move data so that the opening of the head (cluster CL11) of data file #2 may be filled in the result (drawing 11), DEBAIDO.

[0069]3-4 Reproduction management file drawing 12 shows the more detailed data configuration of the reproduction management file PBLIST. The reproduction management file PBLIST is the size of one cluster (1 block = 16 KB). Let 32 bytes of a head be a header. Name NM1-S [as opposed to the whole memory card in portions other than a header] (256 bytes), name NM2-S (512 bytes), CONTENTS KEY, MAC, and S-YMDhms, It is additional information INF-S (14720 bytes) to the whole table TRKTBL (800 bytes) and memory card which manage reproduction order, and, finally a part of information in a header is recorded again. It is specified that each head of these different kinds of data constellations serves as a position within a reproduction management file.

[0070]In a reproduction management file, 32 bytes is a header from the head expressed with (0x0000) and (0x0010). The unit divided per 16 bytes from the head in the file is called a slot. The data which has a following meaning, a function, and a value in the header allotted to the 1st and 2nd slots of a reproduction management file is arranged sequentially from a head. The data Reserved [data] is written expresses the data of the undefined. Usually, although a null (0x00) is written, the data of Reserved is disregarded whatever it may be written. There may be change in a future version. The writing to this portion forbids. When [all] not using the portion written to be Option, either, it is considered as the same treatment as Reserved.

[0071]BLKID-tangent line0 (4 bytes)

semantic : -- BLOCKID FILE ID function: -- the value for identifying that it is a head of a reproduction management file.

Value: Fixed value ="tangent line=0" (for example, 0x544C2D30)

MCode (2 bytes)

Meaning: The code which identifies the maker of the apparatus which MAKER CODE-functioned, was recorded, and a model.

Value: 10 bits (manufacturer code) of higher ranks 6 bits (model code) of low ranks

REVISION (4 bytes)
Meaning: The number of times of rewriting of a reproduction management file (PBLIST).
Function: Whenever it rewrites a reproduction management file, **********.
Value: Start from zero and increase every [1 / +].
[0072]SN1 C+L (2 bytes)
Meaning: Express the attribute of the name (1 byte) of the memory card written to a NM1-S region.
It expresses each with 1 byte the character code and linguistic code which are functioned : used.
Value: A character code (C) distinguishes a character as follows at top 1 byte.
00: Don't set up a character code. It treats as a mere binary number.
01: ASCII 02:ASCII+KANA 03:modifided8859-181:MS-JIS 82:KS C 5601-1989 83:GB2312-80 90:S-JIS(for Voice).
A linguistic code (L) is EBU Tech 3258 as follows in 1 byte of low rank. Language is distinguished according to regulation.
00: Don't set up. When there is no 08:German 09:English 0 A:Spanish0 F:French 15:Italian 1 D:Dutch65:Korean 69:Japanese 75:Chinese data, it is considered as all zero.
[0073]SN2 C+L (2 bytes)
Meaning: Express the attribute of the name (2 bytes) of the memory card written to a NM2-S region.
It expresses each with 1 byte the character code and linguistic code which are functioned : used.
Value: The same as that of SN1 C+L mentioned above.
SINFSIZE (2 bytes)
Meaning: Express the size which totaled all the additional information about the whole memory card written to an INF-S field.
Function: The size of a 16-byte unit describes data size, and when there is nothing, certainly consider it as all zero.
Value: Size is 0x39C (924) from 0x0001.
[0074]T-TRK (2 bytes)
semantic : -- TOTAL TRACK NUMBER function: -- the total track number.
Value: When there are not 1 to 0x0190 (a maximum of 400 tracks) and data, consider it as all zero.
VerNo (2 bytes)
Meaning: The version number of a format.
Function: A higher rank is a major version number and a low rank is a minor version number.
Value: Example 0x0100 (Ver1.0)
0x0203(Ver2.3)
[0075]The data written to the field following the header mentioned above is as follows.
[0076]NM1-S meaning: 1 byte of name about the whole memory card.
Function: Variable-length name data which expressed with 1 byte of character code (being the maximum 256). The end of name data certainly writes in a terminal code (0x00). Size is calculated from this terminal code. When there is no data, 1 bytes or more of null (0x00) is recorded from a head (0x0020) at least.
value: -- various character code NM2-S meaning: -- 2 bytes of name about the whole memory card.

Function: Variable-length name data which expressed with 2 bytes of character code (being the maximum 512). The end of name data certainly writes in a terminal code (0x00). Size is calculated from this terminal code. When there is no data, 2 bytes or more of null (0x00) is recorded from a head (0x0120) at least.
Value: Various character codes.
[0077]CONTENTS KEY meaning: The value prepared for every music.
It is saved after being protected by MG (M). Here, it becomes the same value as CONTENTS KEY attached to the 1st music.

Function: It becomes a key required for calculation of MAC of S-YMDhms.
Value: Up to 0 to 0xFFFFFFFFFFFFFFFF.
MAC meaning: -- copyright information alteration check value function: -- up to value value:0 to 0xFFFFFFFFFFFFFFFF created from the contents and CONTENTS KEY of S-YMDhms.
[0078]TRK-nnn meaning: The SQN (sequence) number of ATRAC3 data file to reproduce
Function: Describe FNo in TRKINF.
Value: From 1 to 400 (0x190)
When a track does not exist, it is considered as all zero.
INF-S meaning: Additional information data about the whole memory card (for example, information, including a photograph, words, description, etc.)
Function: Variable-length additional information data accompanied by a header.
Several different additional information may be put in order. ID and data size are attached to each.
The additional information data containing each header is constituted from a minimum of 16 bytes or more by the unit of 4 bytes of integral multiple. The value for which the details are mentioned later:
It is an additional information data configuration Reference S-YMDhms (4 bytes) (Option)
semantic : -- the time of year, moon, and day - recorded by apparatus with a reliable clock - part and second function: -- indispensable at the time of the value for identifying the last recording date, and EMD.
Value: 25-31 bits Year 0-99 (1980-2079)
21-24 bits Moon Zero to 1216-20 bits Day Zero to 3111-15 bits At the time Zero to 2305-10 bits Part Zero to 5900-04 bits Second 0-29 (two second bits).
[0079]As a slot of the last of a reproduction management file, the BLKID-tangent line0 [same] as the thing in a header, MCode, and REVISION are written.
[0080]For example, when it was extracted while the memory card recorded, or a power supply may be shut off and it revives as noncommercial audio equipment, to detect generating of these abnormalities is needed. REVISION is written in the head and end of a block, and whenever it rewrites this value, he is trying to ********** it +one time, as mentioned above. Therefore, if abnormal termination occurs in the middle of a block, the value of REVISION of a head and an end is not in agreement, and abnormal termination can be detected. Thus, in two REVISION(s) existing, abnormal termination is detectable with high probability. The warning of a display of an error message, etc. occurs at the time of detection of abnormal termination.
[0081]Since fixed value BLKID-tangent line0 is inserted in a 1 block (16 KB) head part, a fixed value can be used for the rule of thumb of restoration when FAT breaks. That is, if the fixed value of the head of each block is seen, it is possible to distinguish the kind of file. And since this fixed value BLKID-tangent line0 is doubly described to the header of a block, and the end part of a block, it can check that reliability. The same thing of the reproduction management file PBLIST may be recorded doubly.
[0082]ATRAC3 data file is considerable big data volume (for example, the block of thousands may be connected) as compared with a reproduction management file, and about ATRAC3 data file, block number BLOCK SERIAL is attached so that it may mention later. However, if BLOCK SERIAL is not attached after attaching distinction of contents by CONNUM0, since ATRAC3 data file usually existed [two or more files] on the memory card, duplication will occur and it will become difficult to restore it of a file when FAT breaks.
[0083]Similarly, although it does not result by destruction of FAT, it makes a mistake in logic, and when [inconvenient as a file] it is, the manufacturer code (MCode) is recorded on the head and end of the block so that the written-in model of maker can be specified.
[0084]Drawing 13 shows the composition of the additional information data (INF-S) recorded on a reproduction management file. The following header is written to the head of additional information. Variable-length data is written after a header.
[0085]INF meaning: -- FIELD ID function: -- the fixed value which shows the head of additional

information data.
value: -- 0x69ID meaning: -- additional information key code function: -- the classification of additional information is shown.
value: -- 0 to 0xFFSIZE meaning: -- size function [of individual additional information]: -- although data size is free, it must be 4 bytes of integral multiple. A minimum of 16 bytes or more of thing. When remainder comes out from the end of data, it buries by the null (0x00).
Value: From 16 to 14784 (0x39C0)
MCode meaning: The code which identifies the maker of the apparatus which MAKER CODE- functioned, : was recorded, and a model.
Value: 10 bits (manufacturer code) of higher ranks 6 bits (model code) of low ranks
C+L meaning: It expresses each with 1 byte the character code and linguistic code showing the attribute of the character written to the data area from [from a head] the 12th byte of which function:use is done.
value: -- the same DATA meaning: as above-mentioned SN1 C+L -- individual additional information data function: -- variable length data expresses. The head of live data must always start from the 12th byte, and a minimum of 4 bytes or more of length (size) must always be 4 bytes of integral multiple. When there is remainder from the last of data, it buries by a null (0x00).
Value: It is individually defined by the contents.
[0086]Drawing 14 shows an example of correspondence of the value (0-63) of an additional information key code, and the kind of additional information. the value (0-31) of a key code is assigned to music relations (text) -- the (32-63) -- it is assigned to URL (Uniform Resource Locator) (Web relations). Text, such as an album title, an artist name, and CM, is recorded as additional information.
[0087]Drawing 15 shows an example of correspondence of the value (64-127) of an additional information key code, and the kind of additional information. the value (64-95) of a key code -- path/-- receiving in addition to this and being assigned -- the (96-127) -- it is assigned to control / numerical value, and data relations. For example, additional information is made into TOC-ID in the case of (ID=98). TOC-ID shows the first music number, the last music number, the music number and total performance time, and its music performance time based on the TOC information of CD (compact disk).
[0088]Drawing 16 shows an example of correspondence of the value (128-159) of an additional information key code, and the kind of additional information. The value (128-159) of the key code is assigned to synchronous reproduction relations. EMD (Electronic Music Distribution) in drawing 16 means electronic music distribution.
[0089]The example of the data of additional information is explained with reference to drawing 17. Drawing 17 (a) shows the data configuration of additional information like drawing 13. The additional information by which drawing 17 (b) is set to key code ID=3 is an example of an artist name. It is referred to as SIZE=0x1C (28 bytes), and it is shown that the data length of this additional information containing a header is 28 bytes. C+L is used as the character code C= 0x01, and let it be the linguistic code L= 0x09. According to the regulation mentioned above, this value is a character code of ASCII and shows that it is an English language. And the data of the artist name of "SIMON&GRAFUNKEL" is written from a head that the 12th byte to 1 byte data are also. Since the size of additional information is decided to be 4 bytes of integral multiple, 1 byte of remainder is set to (0x00).
[0090]The additional information by which drawing 17 (c) is set to key code ID=97 is an example of ISRC (International Standard Recording Code: copyright code). It is referred to as SIZE=0x14 (20 bytes), and it is shown that the data length of this additional information is 20 bytes. C+L is set to C= 0x00 and L= 0x00, and it is shown that there is no setting out of a character and a language, i.e., data is a binary number. And the code of 8 bytes of ISRC is written as data. ISRC shows copyright information (a country, an owner, a sound recording year, a serial number).

[0091]The additional information by which drawing 17 (d) is set to key code ID=97 is an example of sound recording time. It is referred to as SIZE=0x10 (16 bytes), and it is shown that the data length of this additional information is 16 bytes. C+L is set to C= 0x00 and L= 0x00, and it is shown that there is no setting out of a character and a language. And 4 bytes (32 bits) of code is written as data, and sound recording time (at a year, the moon, a day, the time a part, a second) is expressed.
[0092]The additional information by which drawing 17 (e) is set to key code ID=107 is an example of a reproduction log. It is referred to as SIZE=0x10 (16 bytes), and it is shown that the data length of this additional information is 16 bytes. C+L is set to C= 0x00 and L= 0x00, and it is shown that there is no setting out of a character and a language. And 4 bytes (32 bits) of code is written as data, and a reproduction log (at a year, the moon, a day, the time a part, a second) is expressed. The thing with a reproduction log function records 16 bytes of data for every one reproduction.
[0093]3-5 Data file drawing 18 shows the data array of ATRAC3 data file (A3Dnnnn) in case 1SU is N byte (for example, N= 384 bytes). The block as an attribute header and the block with which music data is actually recorded are shown in drawing 18 as a data file as shown by drawing 8. The byte (0x0000-0x7FF0) of the head of each slot of each block (16x2=32 K byte) is shown in drawing 18.
[0094]As shown in drawing 18, 32 bytes is used as a header from the head of an attribute header, 256 bytes is track name field NM1 (256 bytes), and 512 bytes is track name field NM2 (512 bytes). The following data is written to the header of an attribute header.
[0095]BLKID-HD0 (4 bytes)
semantic : -- BLOCKID FILE ID function: -- the value for identifying that it is a head of ATRAC3 data file.
Value: Fixed value ="HD=0" (for example, 0x48442D30)
MCode (2 bytes)
Meaning: The code which identifies the maker of the apparatus which MAKER CODE-functioned, : was recorded, and a model.
Value: 10 bits (manufacturer code) of higher ranks 6 bits (model code) of low ranks
BLOCK SERIAL (4 bytes)
Meaning: The sequence number attached for every track
Function: Even if the head of a block begins from 0 and increment edit of the following block is carried out every [1 / +], don't change a value.
Value: Start from zero and it is to 0xFFFFFFFF.
[0096]N1 C+L (2 bytes)
semantic : -- attribute function [of track (track name) data (NM1)]: -- it expresses each with 1 byte the character code and linguistic code which are used for NM1.
Value: Same Nas SN1 C+L2 C+L (2 bytes)
semantic : -- attribute function [of track (track name) data (NM2)]: -- it expresses each with 1 byte the character code and linguistic code which are used for NM2.
Value: The same INFSIZE as SN1 C+L (2 bytes)
semantic : -- size function: which totaled all the additional information about a track -- data size -- the size of a 16-byte unit -- description. When there is nothing, it is certainly considered as all zero.

Value: Size is 0x0000 to 0x3C6 (966).
T-PRT (2 bytes)
semantic : -- total number-of-multipart-forms function: -- the number of multipart forms which constitutes a track is expressed. Usually, 1.
Value: From 1 to 0x285 (645dec)
T-SU (4 bytes)
semantic : -- several total SU(s) ability: -- the actual total SU number in 1 track is expressed. It is equivalent to the performance time of music.

Value: 0x01 to 0x001FFFFFINX (2 bytes) (Option)
semantic : -- relative place function [of INDEX]: -- the pointer in which the head of the portion (characteristic portion) of the rust of music is shown. The position from the head of music is specified by the number which carried out the number of SU 1/4. This is equivalent to time (about 93 m seconds) 4 times the length of the usual SU.
Value: 0 to 0xFFFF (maximum, about 6084 seconds)
XT (2 bytes) (Option)
semantic : -- regeneration time function [of INDEX]: -- the number of SU of the time which should be reproduced from the head specified by INX-nnn is specified by the number carried out 1/4. This is equivalent to time (about 93 m seconds) 4 times the length of the usual SU.
Value: 0x0000:setting [no] up. 0x01 to 0xFFFE(a maximum of 6084 seconds)0xFFFF: Up to the end of music.
[0097]Next, the track name fields NM1 and NM2 in an attribute header are explained.
[0098]NM1 meaning: -- character string function: showing a track name -- 1 byte of character code -- a table -- the track name (it is 256 at the maximum) of bottom variable length. The end of name data certainly writes in a terminal code (0x00). Size is calculated from this terminal code. When there is no data, 1 bytes or more of null (0x00) is recorded from a head (0x0020) at least.
value: -- character code NM2 various meaning: -- character string function: showing a track name -- 2 bytes of character code -- a table -- the name data (it is 512 at the maximum) of bottom variable length. The end of name data certainly writes in a terminal code (0x00). Size is calculated from this terminal code. When there is no data, 2 bytes or more of null (0x00) is recorded from a head (0x0120) at least.
Value: Various character codes.
[0099]80 bytes of data which begins from the fixed position (0x0320) of an attribute header is called the track information field TRKINF, and security relations and copy control-related information is mainly managed collectively. The data in TRKINF is explained below according to arrangement order.

[0100]CONTENTS KEY (8 bytes)
Meaning: With the value prepared for every music, after being protected by the security block of a memory card, it is saved.
Function: When reproducing music, it becomes the first first needed key. It is used at the time of C-MAC[n] calculation.
Value: It is C-MAC [n] (8 bytes) to 0 to 0xFFFFFFFFFFFFFFFF.
semantic : -- copyright information alteration check value function: -- the value which hides with the contents of two or more TRKINF(s) including a contents accumulation number, and is created from a sequence number. A hidden sequence number is a sequence number currently recorded on the hiding field of the memory card. The recorder which is not copyright correspondence cannot read a hidden field. The personal computer which carries the application which makes it possible to read the recorder of copyright correspondence for exclusive use or a memory card can access a hidden field.
[0101]A (1 byte)
semantic : -- attribute function [of a part]: -- with reference to value:drawing 19 in which information, including the compressed mode in a part, etc., is shown, it explains below, however, as for the monophonic recording of N= 0 and 1, bit7 specifies 0 and the special Joint mode of only a main signal (L+R) for a sub signal as a monophonic recording by 1. The information on bit2 and 1 may disregard the usual reproduction machine.
[0102]The bit 0 of A forms the information on ON and OFF of an emphasis, the bit 1 forms the information on reproduction SKIP and ordinary reproduction, and the bit 2 forms the information on data section, for example, audio information, and other data of FAX etc. The bit 3 is an undefined. Rate information is prescribed by by combining the bits 4, 5, and 6 like a graphic display. N is a value

of the rate expressed with this triplet, and Namely, mono- (N= 0, 1), The record time (in the case of 64 MB of memory card), the data transfer rate, SU number in 1 block, and the number of bytes of 1SU are shown, respectively about five kinds of modes of LP gas (N= 2), SP (N= 4), EX (N= 5, 6), and HQ (N= 7). As for the bit 7, the mode (0:Dual 1:Joint) of ATRAC3 is shown.
[0103]As an example, 64 MB of memory card is used and the case of an SP mode is explained. There are 3968 blocks in 64 MB of memory card. In an SP mode, since 1SU is 304 bytes, 53SU exists in 1 block. 1SU is equivalent to a second (1024/44100). Therefore, 1 block of transfer rates serve as x(44100/1024) 304x8=104737 bps for x(1024/44100) 53x(3968-16) = 4863-second = 81 minutes.
[0104]LT (1 byte)
Meaning: A reproduction restriction flag (the bit 7 and the bit 6) and a security version (the bit 5 - the bit 0)
Function: Mean that there are limitations about this track.
Value: Bit 7: With no 0= restrictions Bit 6 with 1= restriction: Inside of 0= term 1= expiration bit 5 - the bit 0: Security version 0 (if it is except zero, it will be considered as reproduction inhibit)
FNo (2 bytes)
Meaning: File number
Function: It is a track number when recorded first, and this value pinpoints the position of the value of MAC calculating recorded on the hiding field in a memory card.
Value: From 1 to 0x190 (400)
MG(D) SERIAL-nnn (16 bytes)
Meaning: The serial number of a security block (security IC20) of a recording device.
Function: A peculiar value which is altogether different for every recording device.
Value: From 0 to 0xFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFCONNUM (4 bytes)
Meaning: Contents accumulation number
Function: It is managed by the security block of a recording device with the peculiar value accumulated for every music. 2 is prepared by 4,200 million music the 32nd power, and it is used for the recorded discernment of music.
[0105]Value: 0 to 0xFFFFFFFF.
[0106]YMDhms-S (4 bytes) (Option)
semantic : -- the time of the reproduction opening day of a track with reproduction restrictions --
function: -- the time to which the reproduction start specified by EMD is permitted.
Value: It is the same as the notation of the time mentioned above.
YMDhms-E (4 bytes) (Option)
semantic : -- the time of the reproduction end date of a track with reproduction restrictions --
function: -- the time which ends the reproducing permission specified by EMD.
Value: It is the same as the notation of the time mentioned above.
MT (1 byte) (Option)
semantic : -- maximum function [of the number of times of a reproducing permission]: -- the maximum reproduction frequency specified by EMD.
value: -- 1 to 0xFF -- when intact, it is 0x00. The value of MT is set to 00 when the value of bit7 of LT is 0.
CT (1 byte) (Option)
semantic : -- reproduction frequency function: -- the number of times actually renewable among the number of times by which the reproducing permission was carried out. A decrement is carried out to a reproductive degree.
value: -- 0x00 - 0xFF -- when intact, it is 0x00. bit7 of LT forbids reproduction, when the value of CT is 00 in 1.
[0107]CC (1 byte)
semantic : -- COPY CONTROL function: -- copy control value: -- as shown in drawing 20, the bits

6 and 7 express copy control information, the bits 4 and 5 express the copy control information about a high-speed digital copy, and the bits 1, 2, and 3 express a copy attribute. The bit 0 is an undefined.
example [of CC]: -- The bit 7 ... 0: -- Copy prohibition and 1:copy permission bit 6 ... 0:original copy. 1: The 1st [or more] generation bit 5, 4...00 : it is shown that they are copy prohibition, the 1st generation of 01:copy, 10:copy good bits 3 and 2, and the contents recorded from the 1001:original source.
010: It is shown that they are the contents copied from LCM.
011: It is shown that they are the contents which carried out the move from LCM.
100 or more: Undefined.
LCM is Licensed Compliant Module, for example, a personal computer, HDD in consumer apparatus, etc. correspond. For example, to the digital sound recording from CD, as for bit3, and (2, 1), 01, (bit5, and 4) becomes 001 or 010, as for (bit7 and 6). [00, and]
[0108]CN (1 byte) (Option)
semantic : -- number-of-times function of copy permission: in the high-speed digital copy HSCMS (High speed Serial Copy ManagementSystem) -- copy[one copy and]-free -- that distinction is extended and it specifies by the number of times. Only in the 1st generation of a copy, it is effective, and subtracts for every copy.
value: -- 00: -- copy prohibition, the number of times of 0xFE: from 01, and the number of times of 0xFF: -- unrestricted.
[0109]In the attribute header in a data file, PRTINF is arranged in when 24 bytes of data which begins from 0x0370 is called the part information field PRTINF for part management following the above track information fields TRKINF and it constitutes one track from two or more parts in order of the time-axis. The data in PRTINF is explained below according to arrangement order.
[0110]PRTSIZE (4 bytes)
semantic : -- part size function: -- the size of a part is expressed. Cluster: 2 bytes (top), start SU:1 byte (higher rank), end SU:1 byte (lowest)
value: -- cluster: -- 1 to 0x1F40 (8000), start SU:0 to 0xA0 (160), and end SU:0 to 0xA0 (160) (however, how to count SU begins from 0, 1, 2, and 0)
PRTKEY (8 bytes)
semantic : -- value function [for enciphering a part]: -- the rule of edit is followed at the time of initial value =0 and edit.
Value: From 0 to 0xFFFFFFFFFFFFFFFFCONNUM0 (4 bytes)
Meaning: The role of ID for making unique the contents accumulation number key function:contents made first.
Value: It is considered as the same value as a contents accumulation number initial value key.
[0111]In the attribute header of ATRAC3 data file, as shown in drawing 18, additional information INF is contained. This additional information is the same as that of additional information INF-S (refer to drawing 12) in a reproduction management file except for the point that the starting position is not fixed. The data of additional information INF begins by making the next of the byte portion (4-byte unit) of the last of one or more parts into a starting position.
[0112]INF meaning: -- additional information data function: about a track -- the variable-length additional information data accompanied by a header. Several different additional information may be put in order. ID and data size are added to each. The additional information data containing each header is the same as additional information INF-S in 4 bytes of unit value:reproduction management file of an integral multiple at a minimum of 16 bytes or more.
[0113]The data of each block with which ATRAC3 data is recorded continues to the above attribute headers. As shown also in drawing 8, a header is added for every block. The data within a block shown in drawing 18 is explained below.
[0114]BLKID-A3D (4 bytes)

semantic : -- BLOCKID FILE ID function: -- the value for identifying that it is a head of ATRAC3 data.
Value: Fixed value ="A3D" (for example, 0x41334420)
MCode (2 bytes)
Meaning: The code which identifies the maker of the apparatus which MAKER CODE-functioned, was recorded, and a model.
Value: 10 bits (manufacturer code) of higher ranks 6 bits (model code) of low ranks
CONNUM0 (4 bytes)
Meaning: The contents accumulation number made first
function: -- the role of ID for making contents unique -- a value is not changed even if edited.
Value: It is considered as the same value as a contents accumulation number initial value key.
BLOCK SERIAL (4 bytes)
Meaning: The sequence number attached for every track
Function: Even if the head of a block begins from 0 and increment edit of the following block is carried out every [1 / +], don't change a value.
Value: Start from zero and it is to 0xFFFFFFFF.
BLOCK-SEED (8 bytes)
semantic : -- one key function: for enciphering 1 block -- the value which the head of the block generated the random number with the security block of the recording device, and **********ed the continuing block +one time. Since a sound cannot be made while [about 1 second] it is equivalent to 1 block if this value is lost, the same thing as a header and a block end is written doubly. A value is not changed even if edited.
Value: It is 8 bytes of random number the first stage.
INITIALIZATION VECTOR (8 bytes)
Meaning: The value of 8 bytes for which the head of the required initial value function:block began from 0 when enciphering and decrypting ATRAC3 data for every block, and the last of the last SU was enciphered as for the following block. The case from the middle of the block [DEBAIDO / block] uses 8 bytes of the last in front of the start SU. A value is not changed even if edited.
value: -- 0 to 0 xFFFFFFFFFFFFFFFFSU-nnn meaning: -- data function [of a sound unit]: -- the data compressed from 1024 samples differs from the number of bytes outputted by compressed mode. A value is not changed even if edited (the time of an SP mode as an example N= 384 bytes).
Value: The data value of ATRAC3.
[0115]In drawing 18, since it is N= 384, 42SU is written to 1 block. Two slots (4 bytes) of a 1-block head are used as a header, and BLKID-A3D, MCode, CONNUM0, and BLOCK SERIAL are doubly written to the last one slot (2 bytes). Therefore, too much 1-block field M byte (set to 16,384-384x42-16x3=208 (byte).), As mentioned above in this, 8 bytes of BLOCK SEED is recorded doubly.
[0116]4. Recording processing 4-1 One or less example of processing and the example of processing at the time of the recording operation of the contents (music) by the recorder 1 of this example are explained. There is not only record of contents data but the generation or updating of a reproduction management file which is the capacity for 1 block (one cluster) record of the contents to the memory card 40, and it completes it so that I may be understood from the explanation mentioned above. Edit of DEBAIDO of contents, a combine, etc. is realized by renewal of a reproduction management file. Let the recording position (absolute address) of the reproduction management file on the memory card 40 be a different position at every writing for renewal of a reproduction management file. When DEBAIDO edit is performed, it is necessary to newly use one cluster (1 block).
[0117]If record of contents is performed from such a situation to all the capacity of a memory card, the creation or updating of the reproduction management file concerning the recording operation becomes impossible. Or if all the capacity of a memory card including contents and a reproduction management file is used up, it will become what cannot perform edit of DEBAIDO etc. after that.

Then, as the capacity of a certain grade is left behind, it is made for record to be completed in this example at the time of recording operation. However, since the capacity of the part of the capacity left behind which can record contents will decrease by such processing, capacity left behind must be made into a suitable quantity.

[0118]When recording the music of average performance time generally, the number of music (the number of contents) of one recording medium (memory card) will be to about 20 music. When FM broadcasting etc. are part[1 hour]-recorded, the data for 1 hour is treated as one contents. A user performs operation of dividing each music, by DEBAIDO from the recorded broadcast. From these situations, the method which makes 20 cluster (20 blocks) part grade the above-mentioned capacity left behind, for example can be considered high [a possibility that about 20 times of DEBAIDO will be performed]. In the state where the contents of ten music (30 minutes) are already recorded, if a 10 more cluster (10 blocks) part grade is statistically made into the above-mentioned capacity left behind, it can be presumed that it can respond to subsequent DEBAIDO edit etc. mostly. Then, according to the number of contents already recorded, the method which sets up the capacity left behind is also considered at the time of a recording start. Or it may be made to set up the capacity left behind from the relation of the average size and full capacity of contents already recorded. Since a possibility of being edited after that several times becomes high when there are few contents and the size of each of those contents is large in a memory card, if it says roughly, it is suitable if the capacity left behind is set up according to the tendency.

[0119]Anyway, in this example, the capacity left behind is set up according to the possibility of the number of times of edit after record.

[0120]DSP30 of the recorder 1 is inputted from the line-in selector 13 or the digital input selector 16, and the processing at the time of recording the data in which encryption processing was performed by the audio encoder / decoder 10 encoding processing and security IC20 on the memory card 40 is shown in drawing 21.

[0121]When record is started, DSP30 is Step F101 first and distinguishes whether contents (data file) are already recorded on the memory card 40 from the management information (reproduction management file) of the memory card 40 with which it is loaded. When one is the memory card 40 in which the data file is not recorded, processing is advanced to Step F102 and "20" is still set to the variable L. This is because the inclusion state of about 20 music can be considered, and a possibility that about 20 times of DEBAIDO will be performed can usually be considered as mentioned above if it puts in another way. Of course, the value "20" is only an example, and the suitable value should be set up according to the capacity of a memory card, etc. It may enable it to fluctuate the value equivalent to this "20" arbitrarily to compensate for whether a user performs his situation and contents of record, for example, edit, repeatedly.

[0122]And at Step F108, a part for 20 clusters (20 blocks) is secured not much as a block in L cluster, i.e., this case. It is the block count as capacity which is a thing here of the capacity which mentioned the block above not much, and which is left behind, that is, is at the end time of record, and should be left behind.

[0123]When one or more data files are already recorded on the memory card 40, processing of DSP30 computes the average file size M of the data file currently followed and recorded on Step F103. This can compute it, if the capacity already used for record of a data file is divided by the number of data files. If the average file size M is computable, the prediction total file N [several] is computed at Step F104 by breaking the full capacity of the memory card 40 by the average file size M. In the prediction total file N [several], when the full capacity of the memory card 40 is used, it is a predicted value of how many data files are recorded.

[0124]And DSP30 distinguishes whether the prediction total file N [several] is below "20" at Step F105. "20" here is used as the number of inclusion music as a general average, and is not limited to "20."

[0125]When the prediction total file N [several] is below "20", it judges that 20 music may be

recorded, and it is Step F106 and the value which subtracted the number of data files already recorded from "20" is set to the variable L. And at Step F108, a part for L cluster (L blocks) is secured not much as a block.

[0126]On the other hand, when it is presupposed at Step F105 that it is the prediction total file N [several] over "20", Only the number of the prediction total files N [several] is judged that a data file may be recorded, and the value which subtracted the number of data files already recorded from the prediction total file N [several] at Step F107 is set to the variable L. And at Step F108, a part for L cluster (L blocks) is secured not much as a block.

[0127]If a block is set up not much as Step F108, record of the data file by audio information will be started from Step F109. Having mentioned the data file above will be recorded by the block unit.

[0128]During recording operation, it is Step F110, and it is supervising whether except for the block, the recordable remaining capacity in the memory card 40 became zero not much. In Step F111, whether the record of 1 or two or more data files which the end of record, i.e., a user, directed was completed, when the user performed recording stop operation from the final controlling element 39, it is supervised whether it became that by which record is ended. Furthermore, at Step F112, as audio information currently supplied, a file change, i.e., music, changes and it is supervised whether it will shift to record of another data file. This file change, i.e., change of music, becomes possible under supervising the track number information included in that digital data etc., when music is supplied as digital audio data, for example from recording media, such as MD and CD. Even when recording about the analog audio signal from the line-in selector 13, it may be made to judge it as a file change, for example by detection of a silent period, etc.

[0129]When it becomes the end of record at Step F111 before rather than an affirmation result comes out at Step F110, DSP30 is Step F118, creates the reproduction management file about the recorded contents (or updating), and finishes recording processing. In this case, the recordable capacity in the memory card 40 is in the state still left behind fully for subsequent record or edit.

[0130]When the file change about the audio information recorded at Step F112 during recording operation is detected, it is the block with which the audio information to the file change point was recorded, and one data file will be formed. Then, the decrement of the variable L is carried out at Step F113, at the time, if the variable L is larger than "1", it will return to Step F108, and a part for L cluster is secured not much as a block. That is, 1 block of setting out as a block is lessened not much. This is that one data file was recorded and is because it is possible that the possibility of the subsequent number of times of DEBAIDO decreased once. And subsequent record is performed after making continuing audio information into the head of a new block as a new data file from Step F109.

[0131]If a track change is detected 19 times during record, when it is Step F114, it will become the variable L= 0. And this is a case where the continuing audio information is recorded as the 20th music. In this case, since a possibility that DEBAIDO edit will be performed after sound recording will become very low, Although considering only it a block may be kept not much as zero according to becoming the variable L= 0, since the writing of a playback management file is actually needed after sound recording, it is at least at the end time of sound recording, and 1 block must be left behind. Then, when the variable L becomes less than one (that is, 0) at Step F114, it is Step F116 and at least 1 block is secured not much as a block at Step F108 as the variable L= 1. Subsequent edit cannot be performed, if a block is used not much for the writing of the reproduction management file after the end of record in this case and the full capacity of the memory card 40 is consumed by it. So, in Step F115, it is shown that there is a possibility that the edit after the end of record may become impossible to a user. For example, a message to that effect is displayed on the indicator 33. However, since record or edit is still possible when judged as the end of record at Step F111 (i.e., when the block not much recordable besides a block is left behind) before an affirmation result comes out at Step F110 after that, it is not necessary to necessarily perform an alarm display at this time.

[0132]In Step F110, it leaves the block count set up not much as area at the time, and when it is judged that the block recordable on others has been used up, it progresses to Step F117 and DSP30 suspends recording operation compulsorily. And the reproduction management file about the contents recorded at Step F118 is created (or updating), and recording processing is finished. In this case, the recordable capacity in the memory card 40 is in the state where only the block count set up not much as area is left behind. And the block count as a block is set up not much according to the recorded number of music already being subtracted etc. from the thing [that 20 music is usually recorded], that the number of inclusion music is presumed from the relation between average data size and full capacity, and those numbers of inclusion music to have mentioned above. If music is furthermore divided during record (file change), the decrement of the block count is carried out not much. It is at the end time of record, and the number of times only of edit generally predicted after that at least turns into the block count which is sufficient for making edit possible from these things. Therefore, even when sensing that the user has used up the recordable area of the memory card 40 at the time of contents recording, edit of the number of times which is usually needed at least will be enabled, and does not make a user stop sensing inconvenience. The block count is set up not much as the minimum number of times in the number of times of edit usually needed according to a contents recording situation by the block count being set up not much according to the variable L as mentioned above, and a decrement being carried out during record by one side. This means being seldom what sets up many block counts too much and makes record possible capacity of contents small more than needed by that cause. That is, by the recording processing of this example, if possible, after making it not decrease the storage capacity of contents, the edit needed after that can be changed into the state which can be performed.

[0133]After Step F110 is ended after the block has decreased to 1 block not much as mentioned above, and record is ended by F117, it becomes what is used for record of a reproduction management file, and its block and 1 block carried out not much of all the blocks serve as used at the time. That is, edit is impossible henceforth. (According to the view of this example, in this case, since it is already divided into 20 or the number of music beyond it, it is in the state where there is no necessity for DEBAIDO edit). Then, in such a case, it may be made to perform the warning process explained as Step F115. At the time, the edit prohibition process which repeals editing operation may be performed. When a reproduction management file is not newly recorded on a certain block but an old reproduction management file "is updated" in this case, the block with which the old reproduction management file was recorded turns into a block which can be written in. Therefore, a combine, a move, erasion, etc. are possible for the edit realized only by renewal of a reproduction management file. Then, in such a case, the above-mentioned warning and an edit prohibition process may be performed as what was restricted to DEBAIDO edit.

[0134]By the way, although explanation of the above processing also explained the block used for the writing of the reproduction management file in Step F118 at the end time of record as what is secured not much as a block at least, It may consider processing of drawing 21 that the block used for the writing of the reproduction management file in Step F118 is secured apart from "blocking not much." In that case, even if Step F110 is ended after the block has decreased to 1 block not much as mentioned above, record is ended by F117 and record of a reproduction management file is performed, a block and 1 block carried out are left behind not much. Therefore, a combine, a move, erasion, etc. are possible for the edit realized only by renewal of a reproduction management file. Since the block with which the old reproduction management file was recorded is also can be written in when a reproduction management file is updated, 2 blocks can be written in and DEBAIDO is also possible. Therefore, as for the above-mentioned alarm display or an edit prohibition process, it is preferred to carry out according to these situations.

[0135]Although it was made for the block count to decrease simply not much in the example of processing of drawing 21 according to the file change, As block setting out is performed including the data file formed by the audio information to the timing of a file change just because it responded

to the average file size and full capacity like Steps F103-F107, it may be made for setting out of the block to change not much.

[0136]4-2 Continue example of processing 2 and drawing 22 explains the recording processing as the example 2 of processing. In drawing 22, about the same processing as above-mentioned drawing 21, the same step number is attached as Steps F101-F118, and explanation is omitted. That is, as for this example 2 of processing, Steps F100 and F119 - 121 are added to processing of above-mentioned drawing 21.

[0137]In this case, in order to enable a user's edit after record, it enables it to choose whether record possible capacity of contents is increased as much as possible, without seldom taking whether a block is set up and such a thing into consideration. That is, the operational mode which a user makes end recording operation by operation from the final controlling element 39 for example when the recordable block residue except the amount of blocks serves as zero not much, It enables it to choose the operational mode (using-up setting out) which enables continuation of recording operation until a block residue recordable on the memory card 40 serves as zero.

[0138]When a user makes record start without performing using-up setting out, the recording processing of DSP30 turns into the same processing as drawing 21 (F101-F118). However, when it sets up by the user having used up and recording operation is made to start, DSP30 performs processing of Step F119, F120, and F121. That is, record of the data file by audio information is started from Step F119. The data file will be recorded by the block unit.

[0139]And during recording operation, it is Step F120, and it is supervising whether the recordable remaining capacity in the memory card 40 remained, and it became 1 block. In Step F121, whether the record of 1 or two or more data files which the end of record, i.e., a user, directed was completed, when the user performed recording stop operation from the final controlling element 39, it is supervised whether it became that by which record is ended. As audio information currently supplied during record, when a file change is detected, it is the block with which the audio information to the file change point was recorded, and one data file is formed. And subsequent record is performed after making continuing audio information into the head of a new block as a new data file.

[0140]When it becomes the end of record at Step F121 before rather than an affirmation result comes out at Step F120, DSP30 is Step F118, creates the reproduction management file about the recorded contents (or updating), and finishes recording processing. In this case, the recordable capacity in the memory card 40 is in the state still left behind fully for subsequent record or edit.

[0141]In Step F120, it leaves 1 block count at the time, and when it is judged that the recordable block has been used up, it progresses to Step F117 and DSP30 suspends recording operation compulsorily. And at Step F118, the reproduction management file about the recorded contents is created to the remaining 1 blocks (or updating), and recording processing is finished. In this case, it means that the recordable capacity in the memory card 40 was used for record of the maximum and contents. That is, in this example 2 of processing, if it is a case where the edit after record is not considered, it can be made to carry out by a user's selection at record of contents the maximum use of the capacity of the memory card 40.

[0142]4-3 The example 3 of processing is shown in example of processing 3 drawing 23. This example of processing is what fixed setting out of the block not much, and is an example of a fixed value secured as the block count as a block being recordable not much at least at the end time of record.

[0143]That is, when record is started, DSP30 is Step F201 and sets up a part for x cluster as a block not much as a certain set-up fixed value. And record of the data file by audio information is started from Step F202. The data file is recorded by the block unit.

[0144]And the remaining capacity in which it is Step F203 during recording operation, and the record in the memory card 40 is possible, Supervise [x] whether except for the block, it became zero not much, and in Step F204. Whether the record of 1 or two or more data files which the end of record,

i.e., a user, directed was completed, when the user performed recording stop operation from the final controlling element 39, it is supervised whether it became that by which record is ended. As audio information currently supplied during record, when a file change is detected, it is the block with which the audio information to the file change point was recorded, and one data file is formed. And subsequent record is performed after making continuing audio information into the head of a new block as a new data file.

[0145]When it becomes the end of record at Step F204 before rather than an affirmation result comes out at Step F203, DSP30 is Step F206, creates the reproduction management file about the recorded contents (or updating), and finishes recording processing. In this case, the recordable capacity in the memory card 40 is in the state still left behind fully for subsequent record or edit.

[0146]In Step F203, it leaves x block count at the time, and when it is judged that the recordable block has been used up, it progresses to Step F205 and DSP30 suspends recording operation compulsorily. And at Step F206, the reproduction management file about the recorded contents is created using one of x blocks (or updating), and recording processing is finished. In this case, it will be in the state where a part set up not much as a block as recordable capacity in the memory card 40 blocked (x-1) was left behind.

[0147]That is, in this example 3 of processing, it is at the end time of record, and blocked capacity is left behind at least (x-1), and subsequent editing becomes possible only for that part. It is good also as a value statistically considered to be appropriate as a value of x set up fixed, for example, and as a user can set up arbitrarily, for example, processing corresponding to the user's situation and contents of record can be performed.

[0148]As mentioned above, although the example as an embodiment of the invention has been explained, the example of an embodiment is an example to the last, and the composition of a recorder, mode of processing, etc. are considered variously. The setting method of the block count can consider various kinds of various modifications not much especially. Although the above-mentioned example explained supposing the contents (program) as audio information, this invention is completely applicable to the contents as a video data similarly. The same may be said of text data and other contents.

[0149]

[Effect of the Invention]While setting up the amount of remainder blocks of requirements on the occasion of recording operation in this invention so that the above explanation may show, If the recordable block residue except the amount of blocks serves as zero not much on a recording medium, in order to try to terminate program documentation operation by program documentation operation, The record possible capacity which is equivalent to the above-mentioned amount of remainder blocks at least after the end of record of a program (contents) is left behind. By and the thing for which the amount of blocks is set up not much as a block used for record of management information, or the edit of a program updated and/or recorded. It is effective in the state where the field used for edit of the writing / renewal of the management information for completing record of a program, or a subsequent program will be secured, that is, record and edit can perform appropriately being securable. What the amount of blocks is set up not much for according to the number of programs currently recorded on the recording medium in the case of the recording operation by a program documentation means, By or the thing to set up according to the average data size of a program and the capacity of a recording medium which are recorded on the recording medium. It can be considered as a suitable quantity corresponding to the program documentation situation of the recording medium, and can avoid that there are not much too many amounts of blocks to reduce program recording regions recklessly, and amount of blocks sufficient for subsequent edit etc. cannot be secured conversely.

[0150]If a recordable block residue becomes below predetermined in a recording medium, a user can be notified of a situation with outputting the warning of editing processing about the program currently recorded on the recording medium being made improper.

[0151]The operational mode which will terminate program documentation operation if the block residue in which said record excluding the amount of blocks not much is possible on a recording medium serves as zero, It can make it possible to use the storage capacity of a recording medium effectively according to a user's situation by enabling it to choose the operational mode which enables continuation of program documentation operation until a block residue recordable on a recording medium serves as zero.

[Translation done.]

* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL FIELD

[Field of the Invention]This invention relates to the recorder which records programs (contents), such as audio information and a video data, on a recording medium, for example.

[Translation done.]

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PRIOR ART

[Description of the Prior Art]The electrically rewritable nonvolatile memory called EEPROM (Electrically Erasable Programmable ROM), Since 1 bit was constituted from two transistors, the occupation area per bit was large and the limit was to make a degree of location high. In order to solve this problem, the flash memory which can realize 1 bit with one transistor with all the bit collective erasure methods was developed. The flash memory is expected as what can be replaced with recording media, such as a magnetic disk and an optical disc.
[0003]The memory card which constituted the flash memory to apparatus enabling free attachment and detachment is also known. If this memory card is used, record/playback equipment, such as digital audio information which change to disk like media, such as the conventional CD (compact disk) and MD (mini disc), and uses a memory card, are realizable.
[0004]And in the system which carries out record reproduction of the programs (it is also called contents), such as audio information and a video data, by using the memory card using a flash memory as a recording medium. For example, FAT (File Allocation Table) which is a file manager system conventionally used with a personal computer Edit of contents is easily attained by adopting a file system and the device of file management information. For example, if it assumes that the audio information as one musical piece is recorded as one contents, The DEBAIDO edit which divides the contents and is made into two contents, i.e., two music, the combine edit which is made to combine two contents conversely and is made into one contents, i.e., one music, etc. are possible. Thereby, in a user side, it also becomes possible to process arbitrarily the contents recorded on the memory card, and to enjoy them.

[Translation done.]

* NOTICES *

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EFFECT OF THE INVENTION

[Effect of the Invention]While setting up the amount of remainder blocks of requirements on the occasion of recording operation in this invention so that the above explanation may show, If the recordable block residue except the amount of blocks serves as zero not much on a recording medium, in order to try to terminate program documentation operation by program documentation operation, The record possible capacity which is equivalent to the above-mentioned amount of remainder blocks at least after the end of record of a program (contents) is left behind. By and the thing for which the amount of blocks is set up not much as a block used for record of management information, or the edit of a program updated and/or recorded. It is effective in the state where the field used for edit of the writing / renewal of the management information for completing record of a program, or a subsequent program will be secured, that is, record and edit can perform appropriately being securable. What the amount of blocks is set up not much for according to the number of programs currently recorded on the recording medium in the case of the recording operation by a program documentation means, By or the thing to set up according to the average data size of a program and the capacity of a recording medium which are recorded on the recording medium. It can be considered as a suitable quantity corresponding to the program documentation situation of the recording medium, and can avoid that there are not much too many amounts of blocks to reduce program recording regions recklessly, and amount of blocks sufficient for subsequent edit etc. cannot be secured conversely.
[0150]If a recordable block residue becomes below predetermined in a recording medium, a user can be notified of a situation with outputting the warning of editing processing about the program currently recorded on the recording medium being made improper.
[0151]The operational mode which will terminate program documentation operation if the block residue in which said record excluding the amount of blocks not much is possible on a recording medium serves as zero, It can make it possible to use the storage capacity of a recording medium effectively according to a user's situation by enabling it to choose the operational mode which enables continuation of program documentation operation until a block residue recordable on a recording medium serves as zero.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]By the way, it is considered as the system into which the contents as audio information can be edited conventionally, and the mini disc system is known. At this mini disc system, edit of contents has been realized by rewriting what is called TOC data that are the management information which manages contents. And on the mini disc (magneto-optical disc), the program area which records contents, and the management information field which records TOC data are set as according to by predetermined capacity, respectively, and the amount of information of TOC data did not affect the storage capacity of the program (contents). Since it all is [that rewriting of the TOC data in a management information field is only performed, and] even if it repeats edit how many times, this does not affect the storage capacity of a program (contents), either.
[0006]However, if writing is repeated in the same position when it is a flash memory, it is made suitable from there being character in which a memory life is shortened remarkably to move a writing position continuously. For this reason, when the field which records contents in a memory card, and the field which records the management information which manages contents are not pinpointed, for example, it updates management information, new management information is written in a new field, and recording operation which eliminates the old management information is performed. This means that it is necessary to secure only the field which can newly write in ******** management information, when renewal of management information is needed in connection with the recording operation and edit operation of contents. If it puts in another way and there will be no availability more than predetermined, it will be in the state where it becomes what cannot perform renewal of management information, and recording operation is not completed by this, and edit is impossible. In the memory card which performs management of data, etc. by the prescribed unit called block, the amount of 1 block may newly be needed in the cases, such as DEBAIDO edit, for example. If this does not have an availability more than predetermined, either, it means that edit of contents cannot be performed.
[0007]That is, when using the memory card using a flash memory as a recording medium, When the remaining record possible capacity of a memory card becomes less than predetermined by record of contents, there is inconvenience of it becoming impossible to perform renewal of management information required after record and edit about contents currently recorded.

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MEANS

[Means for Solving the Problem]An object in view of such a problem of this invention is for editing processing to enable it renewal of management information according to record of a program (contents), and to perform appropriately.
[0009]For this reason, a recorder of this invention receives a recording medium with which record is performed by a block unit, While setting the amount of remainder blocks of requirements to a program documentation means which blocks and records a program, and a management information recording device which records management information which manages a recorded program on a recording medium, or updates it, By recording operation by a program documentation means, if a recordable block residue except the amount of blocks serves as zero not much on a recording medium, it will have a control means which terminates recording operation by a program documentation means. That is, as a block used for record or updating of management information, and recorded edit of a program, the amount of blocks is set up not much, and recording operation of a program is ended, where capacity set up not much as an amount of blocks is left.
[0010]
[Embodiment of the Invention]Hereafter, the embodiment of the invention is described. According to this embodiment, the memory card which carries the nonvolatile memory (flash memory) as an example of a recording medium is mentioned, and the recorder which can perform record reproduction operation to a memory card as an example of a recorder is mentioned. Although the data as a program (contents) which can be treated in an embodiment has various kinds of things, such as video datas, such as audio information, a video data, and still picture data, text data, and program data, an explanation top shall treat audio information, such as a musical piece. in addition -- making pictures other than digital audio signals, a character, etc. into additional information, even when treating audio information as main contents -- record/-- it becomes refreshable. Explanation is given in the following order.
1. Composition 3. file system [Data file 4. recording processing 4-1 / Example 14-2 of processing / Example 24-3 of processing / Example 3 of processing] 3-1 of composition 2. memory card of recorder Treatment structure and data structure 3-2 directory configuration 3-3 Managing structure and edit method 3-4 Reproduction management file 3-5 [0011]1. The lineblock diagram 1 of a recorder explains the composition of the memory card recording and reproducing device (the following, recorder 1) which can carry out record reproduction of the programs (contents), such as audio information, to a memory card. The memory card which can be detached and attached freely is used for this recorder 1 as a recording medium. And this recorder 1 may be constituted as audio equipment of a simple substance, and may be constituted as an apparatus part built in a personal computer, or an audio / visual apparatus. When you consider it as the audio equipment of a simple substance, let the recorder 1 be a recording and reproducing device of a deferred type or portable small size, for example. In that case, an audio system can also be constituted with an amplifier device, a loudspeaker, a CD player, an MD recorder, a tuner, etc. As a gestalt built in other

apparatus, it is the same positioning as a CD-ROM drive or a floppy disk drive, for example in a personal computer, and can adopt as a memory card drive. It is also possible to build the recorder 1 in a video camera or a game machine machine furthermore, and to use a memory card as a recording medium of a video data or audio information. The recorder 1 is not concerned with the above-mentioned simple substance type and built-in, but can be applied also as a recorder which records the digital audio signals etc. which are distributed via data communications, digital broadcasting, the Internet, etc. which use a satellite.

[0012]Drawing 1 shows the general composition as a memory card recording and reproducing device realizable in the mode of these various kinds. The recorder 1 has the audio encoder / decoder IC10 which comprised a 1 chip IC, respectively, security IC20, and DSP(Digital Signal Processor) 30. And the memory card 40 which can be detached and attached freely is used as a recording medium to the recorder 1. The IC form of the security block with which the memory card 40 includes the enciphering circuit of a flash memory (nonvolatile memory), a memory control block, and DES (Data Encryption Standard) is carried out on 1 chip. In this example, although DSP30 is used, it may replace with DSP and a microcomputer may be used.

[0013]An audio encoder / decoder IC10 have the audio interface 11, and an encoder / decoder block 12. The data which carried out high efficiency coding of an encoder / the decoder block 12 in order to write digital audio signals in the memory card 40, and was read from the memory card 40 is decoded. As a highly efficient encoding method, what (it is written as ATRAC3) improved ATRAC (AdaptiveTransform Acoustic Coding) adopted with the mini disc can be used.

[0014]In ATRAC3, the audio information of 16 bits of one sample sampled at 44.1 kHz is processed. The minimum data unit when processing audio information by ATRAC3 is the sound unit SU. 1SU compresses a part for 1024 samples (1024x16 bits x two channels) into hundreds of bytes, makes it time, and is an about 23-m second. About 1/of audio information is compressed into 10 by ATRAC3. In a mini disc, there is little degradation of the tone quality according to compression/elongation processing by signal processing by which ATRAC3 was devised so that that may be right.

[0015]The line-in selector 13 supplies selectively the reproducing output of MD, the output of a tuner, and a tape reproduction output to A/D converter 14. A/D converter 14 changes the selected line-in signal into digital audio signals of (sampling frequency =44.1kHz and 1 sample =16 bit). The digital input selector 16 supplies selectively the digitized output of MD, CD, and CS (satellite digital broadcasting) to the digital input receiver 17. A digital input is transmitted, for example via an optical cable. The digital input receiver's 17 output is supplied to the sampling rate converter 15, and the sampling frequency of a digital input is changed into 44.1 kHz.

[0016]The coding data obtained by the encoding processing in the encoder / decoder block 12 of an audio encoder / decoder IC10 is supplied to the enciphering circuit 22 of DES via the interface 21 of security IC20. The enciphering circuit 22 of DES has FIFO23. It has for the enciphering circuit 22 of DES to protect the copyright of contents. Although mentioned later, the enciphering circuit of DES is included also in the memory card 40. The enciphering circuit 22 of DES of the recorder 1 has a unique storage key for every apparatus with two or more master keys. The enciphering circuit 22 of DES can have a random number generation circuit, and the memory card 40, the attestation, and the session key which build in the enciphering circuit of DES can be shared. The enciphering circuit 22 of DES can apply a key again by a storage key through the enciphering circuit of DES more nearly further.

[0017]The audio information enciphered from the enciphering circuit 22 of DES is supplied to DSP (Digital Signal Processor) 30. DSP30 performs communication which passes the memory interface 38 shown in drawing 2 between the memory cards 40 with which the attachment-and-detachment mechanism which is not illustrated was equipped, and writes the enciphered data in a flash memory. Serial communication is made between DSP30 and the memory card 40. In order to secure memory space required for control of the memory card 40, external SRAM (Static Random AccessMemory) 31 is connected to DSP30.

[0018]The terminal 32 is connected and it enables it to perform two-way communication of contents data or control data between the external instrument or the external circuit unit which is not illustrated to DSP30 furthermore. DSP30 communicates between external instruments etc. via the interface 37 shown in drawing 2. For example, when this recorder 1 comprises a simple substance, The predetermined communication method should respond, for example to USB, IEEE1394, IEC958, serial port communication, parallel port communication, etc., and communication of the interface 37 and the terminal 32 is enabled between a personal computer, an audio / visual apparatus, etc.

[0019]When this recorder 1 is built in a personal computer, an audio / visual apparatus, etc., the interface 37 and the terminal 32 will take the composition of the internal bus etc. which are connected with the system controller of those apparatus, for example.

[0020]From the apparatus connected to the terminal 32, or a part, various kinds of data is supplied to DSP30. For example, when the recorder 1 is made into the part of an audio system or a computer system, From the system controller of the exterior which controls operation of the whole audio system and computer system, the data of sound recording instructions, a reproduction command, etc. by which it was generated according to a user's operation is given to DSP30. The data of additional information, such as picture information and text, is also supplied to DSP30 via the terminal 32. Furthermore, DSP30 can also supply additional information data, a control signal, etc. which were read from the memory card 40 to an external system controller via the terminal 32.

[0021]The final controlling element 39 in which the operation key etc. to which a user performs various kinds of operations were provided, and the indicator 33 which presents various kinds of information to a user are shown in drawing 1. Especially these are needed when the recorder 1 comprises a simple substance, and when the recorder 1 is built [for example,] in a personal computer, direct continuation of the final controlling element 39 and the indicator 33 does not have to be carried out to DSP30. That is, in the case of a simple substance, although DSP30 will perform processing of the operational input from the final controlling element 39, and display control in the indicator 33, In a built-in case, it is for what is necessary being just to receive the information for which the contents which perform these control, and should supply operation information to DSP30 or the system controller of the device should display on it from DSP30 if needed are shown.

[0022]The audio information enciphered by DSP30 as contents read from the memory card 40 is decrypted by security IC20, and receives the decoding processing of ATRAC3 by an audio encoder / decoder IC10. And the decryption output of an audio encoder / decoder 10 is supplied to D/A converter 18, and is changed into an analog audio signal. And an analog audio signal is taken out by the line-out terminal 19.

[0023]Line-out is transmitted to the amplifier device etc. which are not illustrated, and is reproduced by the loudspeaker or headphone. A muting signal is supplied from an external controller to D/A converter 18. When a muting signal shows one of muting, the audio output from the line-out terminal 19 is forbidden.

[0024]Although drawing 1 shows only the line-out terminal 19, of course, a digital output terminal, a headphone jack, etc. may be provided. The output of the contents data to an external instrument can also be performed via the terminal 32 as mentioned above.

[0025]Drawing 2 shows the internal configuration of DSP30. DSP30 comprises the core 34, the flash memory 35, SRAM36, the interface 37, the memory card interface 38, and a bridge between buses. This DSP30 functions as a microcomputer similarly and the core 34 is equivalent to CPU. The program for processing of DSP30 is stored in the flash memory 35. SRAM36 and SRAM31 of the exterior are used as a work memory for various processing.

[0026]DSP30 answers manipulate signals (or manipulate signal inputted from the final controlling element 39 shown in drawing 1), such as sound recording instructions received via the interface 37, The processing which writes in the enciphered predetermined audio information and predetermined additional information data to the memory card 40, and reads these data from the memory card 40

is controlled. Namely, the application software of the whole audio system for performing record/reproduction of audio information and additional information, DSP30 is located between the memory cards 40 and DSP30 operates with software, such as access of the memory card 40, and a file system.

[0027]The FAT filesystem for which the file management on the memory card 40 in DSP30 is used with the existing personal computer is used. In addition to this file system, by this example, the reproduction management file of a data configuration which is mentioned later is used. A reproduction management file manages the data file currently recorded on the memory card 40. Namely, the reproduction management file as the 1st file management information, Managing the file of audio information, FAT as the 2nd file management information manages the whole file on the flash memory of the memory card 0 including the file and reproduction management file of audio information. A reproduction management file is recorded on the memory card 40. FAT is beforehand written in on the flash memory with the root directory etc. at the time of shipment.

[0028]In this example, in order to protect copyright, the audio information compressed by ATRAC3 is enciphered. It is kept from on the other hand enciphering noting that a management file has unnecessary copyright protection. There may be what has an enciphering function also as the memory card 40, and a thing which it does not have. It is only a memory card with an enciphering function which can use the recorder 1 which records the audio information which is works like this example.

[0029]2. The lineblock diagram 3 of a memory card shows the composition of the memory card 40. As for the memory card 40, the control block 41 and the flash memory 42 are constituted as a 1 chip IC. The bidirectional serial interface between DSP30 of the recorder 1 and the memory card 40 consists of ten lines. Four main lines are with the clock line SCK for transmitting a clock at the time of data communications, status-line SBS for transmitting status, and data-line DIO and interruption line INT that transmit data. In addition, as a line for current supply, two line GND and two VCC lines are formed. The two lines Reserv are lines of the undefined.

[0030]The clock line SCK is a line for transmitting the clock in sync with data. Status-line SBS is a line for transmitting the signal showing the status of the memory card 40. The data line DIO is a line for outputting and inputting a command and the enciphered audio information. Interruption line INT is a line which transmits the interrupt signal which requires interruption to DSP30 of the recorder 1 from the memory card 40. When it equips with the memory card 40, an interrupt signal occurs. However, in this example, since he is trying to transmit an interrupt signal via the data line DIO, interruption line INT has been grounded.

[0031]Serial/parallel conversion, parallel/serial conversion, and the interface block 43 of the control block 41 (it abbreviates to S/P, P/S, and IF block) are the interfaces of DSP30 of the recorder connected via two or more lines mentioned above, and the control block 41. S/P, P/S, and the IF block 43 change into parallel data the serial data received from DSP30 of the recorder 1, are incorporated into the control block 41, change the parallel data from the control block 41 into serial data, and send them to DSP30 of the recorder 1. S/P, P/S, and the IF block 43 separate a command and data, and the command and data required for encryption for the usual access to the flash memory 42, when the command and data which are transmitted via the data line DIO are received.

[0032]That is, in the format transmitted via the data line DIO, a command is transmitted first and data is transmitted after that. S/P, P/S, and the IF block 43 distinguish a command and data required for a usual command and data required for access, and encryption, seeing the code of a command. According to this discriminated result, a command required for the usual access is stored in the command register 44, and data is stored in the page buffer 45 and the light register 46. The error correction code-ized circuit 47 is formed in relation to the light register 46. The error correction code-ized circuit 47 generates the redundancy code of an error correction code to the data temporarily stored in the page buffer 45.

[0033]The output data of the command register 44, the page buffer 45, the light register 46, and the error correction code-ized circuit 47 is supplied to a flash memory interface and the sequencer (it abbreviates to memory I/F and a sequencer) 51. Memory IF and the sequencer 51 are the interfaces of the control block 41 and the flash memory 42, and control an exchange of the data between both. Data is written in the flash memory 42 via memory IF and the sequencer 51.
[0034]The contents (it is written as the audio information compressed by ATRAC3 and following ATRAC3 data) written in the flash memory 42, For copyright protection, it is enciphered by security IC20 of the recorder 1, and the security block 52 of the memory card 40. The security block 52 is provided with the following.
Buffer memory 53.
The enciphering circuit 54 of DES.
Nonvolatile memory 55.

[0035]The security block 52 of the memory card 40 has a unique storage key for every memory card with two or more attestation keys. The nonvolatile memory 55 stores a key required for encryption, and is not visible from the outside. For example, a storage key is stored in the nonvolatile memory 55. It has a random number generation circuit, attestation is possible with the exclusive (meaning in the system with the same use of the existing data format etc. which were decided) recorder 1, and a session key can be shared. It can perform reapplying a key in a storage key through the enciphering circuit 54 of DES more nearly further.
[0036]For example, attestation is made when the recorder 1 is equipped with the memory card 40. Attestation is made by the security block 52 of security IC20 of the recorder 1, and the memory card 40. The recorder 1 will check that a partner is the person himself/herself mutually, if it admits that the memory card 40 with which it was equipped is the person himself/herself (memory card in the same system) and the memory card 40 admits that a partner's recorder is the person himself/herself (recorder in the same system). If attestation is performed, the recorder 1 and the memory card 40 will generate a session key, respectively, and a session key will be shared. A session key is generated by the degree of attestation.
[0037]And at the time of the writing of the contents to the memory card 40, the recorder 1 enciphers a contents key with a session key, and the memory card 40 is passed. In the memory card 40, a contents key is decoded with a session key, it enciphers by a storage key, and the recorder 1 is passed. A storage key is a key unique to each of the memory cards 40, and the recorder 1 will write the contents which performed format processing and were enciphered as the enciphered contents key in the memory card 40, if the enciphered contents key is received.
[0038]At the time of data read-out from the flash memory 42, the read data is supplied to the page buffer 45, the read register 48, and the error correction circuit 49 via memory IF and the sequencer 51. And the data memorized by the page buffer 45 is made for an error correction by the error correction circuit 49. The output of the page buffer 45 and the output of the read register 48 by which the error correction was carried out are supplied to S/P, P/S, and the IF block 43, and are supplied to DSP30 of the recorder 1 via the serial interface mentioned above.
[0039]At the time of such read-out, the contents enciphered with the contents key enciphered by the storage key and the block key are read from the flash memory 42. And by the security block 52, a contents key is decoded by a storage key. It is enciphered with a session key and the contents key furthermore decoded is transmitted to the recorder 1 side. The recorder 1 decodes a contents key with the received session key. The recorder 1 generates a block key by the decoded contents key. With this block key, ATRAC3 enciphered data is decoded one by one.
[0040]The version information of the memory card 40, various kinds of attribution information, etc. are stored in configuration ROM50. The memory card 40 is equipped with the operational switch 60 for erroneous erasure prevention for the user if needed. When this switch 60 is in the connected state of the prohibition on elimination, even if the command which directs to eliminate the flash

memory 42 is sent from the recorder side, elimination of the flash memory 42 is forbidden. The oscillator 61 generates the clock used as the timing basis of processing of the memory card 40.

[0041]3. File system 3-1 Treatment structure and the data structure diagram 4 show the file system processing hierarchy of the system which uses the memory card 40 as a storage. As a file system processing hierarchy, an application process layer is the top and a file management processing layer, a logical address management layer, a physical address management layer, and flash plate memory access set one by one to the bottom of it. In this layered structure, a file management processing layer is a FAT filesystem. The physical address was attached to each block of a flash memory, and the correspondence relation between a block and a physical address is eternal. A logical address is an address which a file management processing layer treats logically.

[0042]Drawing 5 shows an example of the physical configuration of the data of the flash memory 42 in the memory card 40. The data unit by which the flash memory 42 is called a segment is divided to the block (fixed length) of a predetermined number, and 1 block is divided to the page (fixed length) of a predetermined number. In the flash memory 42, it is carried out by elimination bundling up by a block unit, and writing and read-out are performed by bundling up per page.

[0043]Each block and each page are made into the respectively same size, and 1 block is constituted from the page 0 by the page m. It is considered, for example as an 8-KB (K byte) byte or the capacity of 16 KB, and let 1 page 1-block be the capacity of 512B. In the flash memory 42 whole, by the case of 1 block = 8 KB, it is referred to as 4 MB (512 blocks) and 8 MB (1024 blocks), and by the case of 1 block = 16 KB. It is considered as the capacity of 16 MB (1024 blocks), 32 MB (2048 blocks), and 64 MB (4096 blocks).

[0044]1 page consists of 512 bytes of data divisions, and 16 bytes of redundancy parts. Let 3 bytes of the head of a redundancy part be an over-writing portion rewritten according to renewal of data. Block status, page status, and updating status are recorded on 3 bytes of each byte sequentially from a head. 13 bytes of contents of the remainder of a redundancy part are considered as immobilization according to the contents of the data division in principle. These 13 bytes consist of a management flag (1 byte), a logical address (2 bytes), the fields (5 bytes) of format reserve, distributed information ECC (2 bytes), and data ECC (3 bytes). Distributed information ECC is redundant data for error corrections to a management flag, a logical address, and format reserve, and data ECC is redundant data for error corrections to 512 bytes of data.

[0045]As a management flag, it is a system flag (the value and). [1-:-user-] 0: Each flag of a boot block, a translation table flag (1: invalidity, 0:table block), copy prohibition specification (1:O.K., 0:NG), and an access permit (1:free, 0: lead protection) is recorded.

[0046]Two blocks 0 of the head in a segment, i.e., a block, and the block 1 are boot blocks. The block 1 is an object for backup to which the same data as the block 0 is written. A boot block is a leading block of the effective block in the memory card 40, and when apparatus is loaded with the memory card 40, it is a block accessed first. The remaining block is a user block. A header, a system entry, and boot & attribute information are stored in the page 0 of the head of a boot block. Disable block data is stored in the page 1. CIS (Card Information Structure)/IDI (Identify Drive Information) is stored in the page 2.

[0047]The number of entries effective [the header of a boot block] in boot block ID and a boot block is recorded. The starting position of disable block data, its data size, a data type, the data starting position of CIS/IDI, its data size, and a data type are recorded on a system entry. boot & attribute information -- the type (read-only.) of the memory card 40 The data (date of manufacture etc.) relevant to manufacture of the card for whether they are block sizes, such as a hybrid of a lead and the light possibility of, and both types, the block count, the total block count, and security correspondence, etc. are recorded.

[0048]What is called a flash memory produces degradation of an insulator layer by rewriting data, and the number of times of rewriting is restricted. Therefore, it is necessary to prevent access from being repeatedly made intensively to a certain same storage area (block). Therefore, when rewriting

the data of a certain logical address stored in a certain physical address, in the file system of a flash memory. It is made as [write / without carrying out writing in again the data updated to the same block / the data updated to the intact block]. As a result, it changes in after the correspondence relation between a logical address and a physical address before renewal of data updating. Access is prevented from being repeatedly carried out intensively by performing such processing (swap processing is called) to the same block, and it becomes possible to prolong the life of a flash memory.

[0049]Since the data once written in to the block is accompanied, even if the block with which the data before updating and the data after updating are written in moves, from FAT, the same address of a logical address can be seen and it can perform subsequent accesses properly. Since the correspondence relation between a logical address and a physical address changes with swap processings, the logic-physical address translation table showing both correspondence is needed. By referring to this table, access to the block which the physical address corresponding to the logical address specified by FAT is specified, and the specified physical address shows is attained.

[0050]A logic-physical address translation table is stored by DSP30 on SRAM 31 and 36. When there is little RAM capacity, it can store in the flash memory 42. This table is a table which made the physical address (2 bytes) correspond to the logical address (2 bytes) arranged in the ascending order roughly, respectively. Since the maximum capacity of the flash memory 42 is 128 MB (8192 blocks), 2 bytes can express the address of 8192. A logic-physical address translation table is managed for every segment, and the size becomes large according to the capacity of the flash memory 42. For example, in the case where the capacity of the flash memory 42 is 8 MB (two segments), 2 pages is used for logic-physical address translation tables to each of two segments. When a logic-physical address translation table is stored in the flash memory 42, it is directed by predetermined 1 bit of the management flag in the redundancy part of each page mentioned above whether the block concerned is the block with which the logic-physical address translation table is stored.

[0051]It is usable by the FAT filesystem of a personal computer like a disk shape recording medium in the memory card 40 mentioned above. Although not shown in drawing 5, an IPL field, a FAT area, and a root directory field are provided on the flash memory 42. The variety of information of the address with which the program which should be first loaded to the memory of the recorder 1 is written, and the memory is written to the IPL field. The related matters of the block (cluster) are written to the FAT area. The value which shows an intact block, the following block number and a defective block, and the last block, respectively is specified in FAT. Directory entries (a file attribute, an updating date, a start cluster, a file size, etc.) are written to the root directory field.

[0052]He is trying to have a playback management file for managing the part which constitutes each track and each track to the file for music separately from the file manager system specified in the format of the memory card 40 mentioned above in this example. This reproduction management file is recorded on the flash memory 42 using the user block of the memory card 40. By it, even if FAT on the memory card 40 breaks, it becomes restorable [a file].

[0053]This reproduction management file is created by DSP30. For example, attestation is performed, when it is judged whether it is equipped with the memory card 40 when one [a power supply] first and it is equipped with the memory card 40. If it is checked by attestation that it is a regular memory card, the boot block of the flash memory 42 will be read into DSP30. And a logic-physical address translation table is read. The read data is stored in SRAM 31 and 36. Also the memory card 40 used only after a user purchases, FAT and the writing of the root directory are made by the flash memory 42 at the time of shipment. A playback management file will be created if sound recording is made.

[0054]That is, if the sound recording instructions generated by a user's operation etc. are given to DSP30, the audio information which received will be compressed by an encoder / decoder IC10, and ATRAC3 data from an encoder / decoder IC10 will be enciphered by security IC20. And although

ATRAC3 data in which DSP30 was enciphered is recorded on the flash memory 42 of the memory card 40, FAT and a reproduction management file are updated after this record. The degree of renewal of a file, and whenever it starts record of audio information and specifically ends record, FAT and a reproduction management file are rewritten on SRAM31 and 36. And when removing the memory card 40, or when power is turned off, final FAT and a reproduction management file are stored on the flash memory 42 of the memory card 40 from SRAM 31 and 36. In this case, whenever it starts record of audio information and ends record, FAT and the reproduction management file on the flash memory 42 may be rewritten. Also when it edits, the contents of a reproduction management file are updated.

[0055]In the data configuration of this example, additional information is also created and updated in a reproduction management file, and it is recorded on the flash memory 42. Apart from a reproduction management file, an additional information management file may be made to be created. Additional information is given to DSP30 via a bus and the bus interface 32 from an external controller. The additional information which DSP30 received is recorded on the flash memory 42 of the memory card 40. Since it does not pass along security IC20, additional information is not enciphered. Additional information removes the memory card 40, or is written in the flash memory 42 from SRAM of DSP30 at the time of power OFF.

[0056]3-2 Directory configuration drawing 6 shows the directory configuration of the memory card 40. The directory for still pictures, the directory for animations, the directory for sounds, the directory for control, and the directory for music (HIFI) are formed from a root directory so that it may illustrate. By this example, since it explains focusing on musical record/playback, the directory for music is explained hereafter. Two kinds of files are put on the directory for music. One of them is reproduction management file PBLIST.MSF (it is only hereafter written as PBLIST), and other things consist of ATRAC3 data-file A3Dnnnn.MSA (it is only hereafter written as A3D nnn) which stored the enciphered music data. ATRAC3 data file is prescribed that the maximum number is to 400. After registering ATRAC3 data file into a reproduction management file, it is arbitrarily created by apparatus.

[0057]3-3 Managing structure and edit method drawing 7 show the composition of a reproduction management file, and drawing 8 shows the composition of one ATRAC3 data file (one music). A reproduction management file is a file of 16KB fixed length. As shown in drawing 7, a reproduction management file consists of additional information INF-S of the reproduction table TRKTBL of name NM1-S of the memory card of a header and a single byte code, name NM2-S of the memory card of a 2-byte code, and playing order, and the whole memory card.

[0058]ATRAC3 data file (only henceforth a data file) shown in drawing 8 is equivalent to the program (or contents) as used in the field of this invention, and is a file of a music unit. And a data file consists of a top attribute header and enciphered actual music data following it. An attribute header is made into 16-KB fixed length, and has a reproduction management file and similar composition. The attribute header of the head of a data file consists of track information TRKINF(s), such as track name NM2 of 1 or 2 bytes of track name NM code of a header and a single byte code, and key information on a track, part information PRTINF, and additional information INF of a track. The information on the total number of multipart forms, the attribute of a name, and the size of additional information, etc. are included in a header.

[0059]In this data file, the music data of ATRAC3 continues to an attribute header. Music data is divided for 16 KB of every block, and the header is added to the head of each block. The initial value for decoding a code is included in a header. Only the music data in ATRAC3 data file receives processing of encryption, and the data of the other reproduction management file, a header, etc. is not enciphered.

[0060]With reference to drawing 9, the relation between music (contents) and ATRAC3 data file is explained. One contents mean the data constellation managed as one music. One music comprises one ATRAC3 data file (refer to drawing 8). The audio information into which ATRAC3 data file was

compressed by ATRAC3 is recorded.
[0061]To the memory card 40, record of data is performed in the unit called a cluster. One cluster is 16 KB in capacity. Two or more files do not mix with this one cluster. The minimum unit when eliminating the flash memory 42 is 1 block. In the case of the memory card 40 used for recording music data, a block and a cluster are convertible terms and are defined as 1 cluster =1 sector.
[0062]Although one music comprises one part fundamentally, when edit is performed, one music may comprise two or more parts.A part means the unit of the data recorded by within a time [which continued from a recording start to the stop], and one contents usually comprise one part. When one contents comprise two or more parts, relation of the part in music is managed by part information PRTINF (after-mentioned) in the attribute header of each music. That is, 4 bytes of data called the part size PRTSIZE in PRTINF expresses part size. 2 bytes of the head of the part size PRTSIZE show the total of the cluster which a part has, and the next 1 byte each shows the position of the start sound unit (it is written as SU) in a head and the cluster of an end, and the position of the end SU. By having a describing method of such a part, when editing music data, it becomes possible to usually lose movement of a lot of music data needed. If it limits to edit of a block unit, movement of music data is avoidable similarly, but as compared with SU unit, the edit unit of a block unit is too large.
[0063]SU is the minimum unit of a part and is the minimum data unit when compressing audio information by ATRAC3. Hundreds of bytes of data which compressed into 10 about 1/of audio information for 1024 samples obtained by a 44.1-kHz sampling frequency (1024x16 bits x two channels) is SU. 1SU will be converted into time and will be an about 23-m second. Usually, one part is constituted by SU which attains to thousands. When one cluster comprises 42 SU(s), the sound for about 1 second can be expressed with one cluster. The number of the parts which constitute one contents is influenced by additional information size. Since it is decided by the number excluding a header, a track name, additional information data, etc. out of 1 block, the number of multipart forms serves as conditions for which the state where there is no additional information can use the part of the maximum number (645 pieces).
[0064]Drawing 9 shows the file organization at the time of recording two audio information from CD etc. continuously. The case where the 2nd (data file #2) music is constituted from six clusters (CL5-CL10) by drawing 9 (c) when the 1st (data file #1) music is constituted from five clusters (CL0-CL4) by drawing 9 (a) is shown. Since two files are not allowed to be intermingled in one cluster between the 2nd music with the 1st music, data file #2 is created from the beginning of the following cluster (CL5). Therefore, as the termination (termination of the 1st music) of data file #1 is a cluster, even if it is located, as expanded and shown in drawing 9 (b), data (SU) shall not exist in the remaining portion of the cluster. The 2nd music (data file #2) is the same. And in the case of this example, data file #1 and #2 comprise one part.
[0065]To the data file recorded on the memory card 40, DEBAIDO, a combine, erasion, and four kinds of processings of a move are specified as edit. DEBAIDO is dividing one track into two. If DEBAIDO is carried out, the total one track number will increase. DEBAIDO divides one file on a file system, considers it as two files, and updates a reproduction management file. A combine is combining two tracks with one. If a combine is carried out, the total one track number will decrease. A combine unifies two files on a file system, carries out them to one file, and updates a reproduction management file. Erasion is eliminating a track. One track number after being erased decreases. The move as editing processing is changing track turn. A reproduction management file is updated also in this case. The "move" as editing processing here is not accompanied by movement of data. For example, a meaning differs from the "move" of the data from recording media, such as HDD, to recording media, such as a memory card. After the move from a recording medium to a recording medium copies data, it is realized by eliminating the data from the recording medium of a copied material.
[0066]The result of having carried out the combine of the two music (data file #1, #2) shown in

drawing 9 is shown in drawing 10. By the combine having been carried out, data file #1 and #2 are set to one data file #1, and this data file #1 is formed from two parts. Since there is a describing method about a part in this example as mentioned above, the starting position of the part 1, the end position of the part 1, the starting position of the part 2, and the end position of the part 2 can be specified to the result (drawing 10) of having carried out the combine, per SU, respectively. As a result, in order to pack the crevice between the knots of the result which carried out the combine, it is not necessary to move the music data of the part 2.

[0067]Drawing 11 shows the result, DEBAIDO [one music (data file #1) of drawing 9 (a)] in the middle of the cluster 2. By DEBAIDO, data file #2 which consists of cluster CL3 and CL4 data file #1 which consists of a front side of cluster CL0, CL1, and cluster CL2, and the backside of cluster CL2 (CL11) occurs. Since two files are not allowed to be intermingled in one cluster as mentioned above, in the DEBAIDO edit which makes a division point a certain position in cluster CL2 in this way, it is first copied to cluster CL11 [another] in which the data of cluster CL2 has opened. And the position equivalent to the division point in cluster CL11 is made into the starting point, and it is made for cluster CL3 and CL4 to follow the cluster CL11 in data file #2. Therefore, in DEBAIDO edit, it is necessary to newly use not only the renewal of a reproduction management file but one cluster.

[0068]Since there is a describing method about a part as mentioned above, it is not necessary to move data so that the opening of the head (cluster CL11) of data file #2 may be filled in the result (drawing 11), DEBAIDO.

[0069]3-4 Reproduction management file drawing 12 shows the more detailed data configuration of the reproduction management file PBLIST. The reproduction management file PBLIST is the size of one cluster (1 block = 16 KB). Let 32 bytes of a head be a header. Name NM1-S [as opposed to the whole memory card in portions other than a header] (256 bytes), name NM2-S (512 bytes), CONTENTS KEY, MAC, and S-YMDhms, It is additional information INF-S (14720 bytes) to the whole table TRKTBL (800 bytes) and memory card which manage reproduction order, and, finally a part of information in a header is recorded again. It is specified that each head of these different kinds of data constellations serves as a position within a reproduction management file.

[0070]In a reproduction management file, 32 bytes is a header from the head expressed with (0x0000) and (0x0010). The unit divided per 16 bytes from the head in the file is called a slot. The data which has a following meaning, a function, and a value in the header allotted to the 1st and 2nd slots of a reproduction management file is arranged sequentially from a head. The data Reserved [data] is written expresses the data of the undefined. Usually, although a null (0x00) is written, the data of Reserved is disregarded whatever it may be written. There may be change in a future version. The writing to this portion forbids. When [all] not using the portion written to be Option, either, it is considered as the same treatment as Reserved.

[0071]BLKID-tangent line0 (4 bytes)

semantic : -- BLOCKID FILE ID function: -- the value for identifying that it is a head of a reproduction management file.

Value: Fixed value ="tangent line=0" (for example, 0x544C2D30)

MCode (2 bytes)

Meaning: The code which identifies the maker of the apparatus which MAKER CODE-functioned, : was recorded, and a model.

Value: 10 bits (manufacturer code) of higher ranks 6 bits (model code) of low ranks

REVISION (4 bytes)

Meaning: The number of times of rewriting of a reproduction management file (PBLIST).

Function: Whenever it rewrites a reproduction management file, **********.

Value: Start from zero and increase every [1 / +].

[0072]SN1 C+L (2 bytes)

Meaning: Express the attribute of the name (1 byte) of the memory card written to a NM1-S region.

It expresses each with 1 byte the character code and linguistic code which are functioned : used.
Value: A character code (C) distinguishes a character as follows at top 1 byte.
00: Don't set up a character code. It treats as a mere binary number.
01: ASCII 02:ASCII+KANA 03:modifided8859-181:MS-JIS 82:KS C 5601-1989 83:GB2312-80 90:S-JIS(for Voice).
A linguistic code (L) is EBU Tech 3258 as follows in 1 byte of low rank. Language is distinguished according to regulation.
00: Don't set up. When there is no 08:German 09:English 0 A:Spanish0 F:French 15:Italian 1 D:Dutch65:Korean 69:Japanese 75:Chinese data, it is considered as all zero.
[0073]SN2 C+L (2 bytes)
Meaning: Express the attribute of the name (2 bytes) of the memory card written to a NM2-S region.
It expresses each with 1 byte the character code and linguistic code which are functioned : used.
Value: The same as that of SN1 C+L mentioned above.
SINFSIZE (2 bytes)
Meaning: Express the size which totaled all the additional information about the whole memory card written to an INF-S field.
Function: The size of a 16-byte unit describes data size, and when there is nothing, certainly consider it as all zero.
Value: Size is 0x39C (924) from 0x0001.
[0074]T-TRK (2 bytes)
semantic : -- TOTAL TRACK NUMBER function: -- the total track number.
Value: When there are not 1 to 0x0190 (a maximum of 400 tracks) and data, consider it as all zero.
VerNo (2 bytes)
Meaning: The version number of a format.
Function: A higher rank is a major version number and a low rank is a minor version number.
Value: Example 0x0100 (Ver1.0)
0x0203(Ver2.3)
[0075]The data written to the field following the header mentioned above is as follows.
[0076]NM1-S meaning: 1 byte of name about the whole memory card.
Function: Variable-length name data which expressed with 1 byte of character code (being the maximum 256). The end of name data certainly writes in a terminal code (0x00). Size is calculated from this terminal code. When there is no data, 1 bytes or more of null (0x00) is recorded from a head (0x0020) at least.
value: -- various character code NM2-S meaning: -- 2 bytes of name about the whole memory card.

Function: Variable-length name data which expressed with 2 bytes of character code (being the maximum 512). The end of name data certainly writes in a terminal code (0x00). Size is calculated from this terminal code. When there is no data, 2 bytes or more of null (0x00) is recorded from a head (0x0120) at least.
Value: Various character codes.
[0077]CONTENTS KEY meaning: The value prepared for every music.
It is saved after being protected by MG (M). Here, it becomes the same value as CONTENTS KEY attached to the 1st music.
Function: It becomes a key required for calculation of MAC of S-YMDhms.
Value: Up to 0 to 0xFFFFFFFFFFFFFFFF.
MAC meaning: -- copyright information alteration check value function: -- up to value value:0 to 0xFFFFFFFFFFFFFFFF created from the contents and CONTENTS KEY of S-YMDhms.
[0078]TRK-nnn meaning: The SQN (sequence) number of ATRAC3 data file to reproduce
Function: Describe FNo in TRKINF.

Value: From 1 to 400 (0x190)
When a track does not exist, it is considered as all zero.
INF-S meaning: Additional information data about the whole memory card (for example, information, including a photograph, words, description, etc.)
Function: Variable-length additional information data accompanied by a header.
Several different additional information may be put in order. ID and data size are attached to each.
The additional information data containing each header is constituted from a minimum of 16 bytes or more by the unit of 4 bytes of integral multiple. The value for which the details are mentioned later:
It is an additional information data configuration Reference S-YMDhms (4 bytes) (Option)
semantic : -- the time of year, moon, and day - recorded by apparatus with a reliable clock - part and second function: -- indispensable at the time of the value for identifying the last recording date, and EMD.
Value: 25-31 bits Year 0-99 (1980-2079)
21-24 bits Moon Zero to 1216-20 bits Day Zero to 3111-15 bits At the time Zero to 2305-10 bits Part Zero to 5900-04 bits Second 0-29 (two second bits).
[0079]As a slot of the last of a reproduction management file, the BLKID-tangent line0 [same] as the thing in a header, MCode, and REVISION are written.
[0080]For example, when it was extracted while the memory card recorded, or a power supply may be shut off and it revives as noncommercial audio equipment, to detect generating of these abnormalities is needed. REVISION is written in the head and end of a block, and whenever it rewrites this value, he is trying to ********** it +one time, as mentioned above. Therefore, if abnormal termination occurs in the middle of a block, the value of REVISION of a head and an end is not in agreement, and abnormal termination can be detected. Thus, in two REVISION(s) existing, abnormal termination is detectable with high probability. The warning of a display of an error message, etc. occurs at the time of detection of abnormal termination.
[0081]Since fixed value BLKID-tangent line0 is inserted in a 1 block (16 KB) head part, a fixed value can be used for the rule of thumb of restoration when FAT breaks. That is, if the fixed value of the head of each block is seen, it is possible to distinguish the kind of file. And since this fixed value BLKID-tangent line0 is doubly described to the header of a block, and the end part of a block, it can check that reliability. The same thing of the reproduction management file PBLIST may be recorded doubly.
[0082]ATRAC3 data file is considerable big data volume (for example, the block of thousands may be connected) as compared with a reproduction management file, and about ATRAC3 data file, block number BLOCK SERIAL is attached so that it may mention later. However, if BLOCK SERIAL is not attached after attaching distinction of contents by CONNUM0, since ATRAC3 data file usually existed [two or more files] on the memory card, duplication will occur and it will become difficult to restore it of a file when FAT breaks.
[0083]Similarly, although it does not result by destruction of FAT, it makes a mistake in logic, and when [inconvenient as a file] it is, the manufacturer code (MCode) is recorded on the head and end of the block so that the written-in model of maker can be specified.
[0084]Drawing 13 shows the composition of the additional information data (INF-S) recorded on a reproduction management file. The following header is written to the head of additional information. Variable-length data is written after a header.
[0085]INF meaning: -- FIELD ID function: -- the fixed value which shows the head of additional information data.
value: -- 0x69ID meaning: -- additional information key code function: -- the classification of additional information is shown.
value: -- 0 to 0xFFSIZE meaning: -- size function [of individual additional information]: -- although data size is free, it must be 4 bytes of integral multiple. A minimum of 16 bytes or more of thing. When remainder comes out from the end of data, it buries by the null (0x00).

Value: From 16 to 14784 (0x39C0)
MCode meaning: The code which identifies the maker of the apparatus which MAKER CODE-functioned, : was recorded, and a model.
Value: 10 bits (manufacturer code) of higher ranks 6 bits (model code) of low ranks
C+L meaning: It expresses each with 1 byte the character code and linguistic code showing the attribute of the character written to the data area from [from a head] the 12th byte of which function:use is done.
value: -- the same DATA meaning: as above-mentioned SN1 C+L -- individual additional information data function: -- variable length data expresses. The head of live data must always start from the 12th byte, and a minimum of 4 bytes or more of length (size) must always be 4 bytes of integral multiple. When there is remainder from the last of data, it buries by a null (0x00).
Value: It is individually defined by the contents.
[0086]Drawing 14 shows an example of correspondence of the value (0-63) of an additional information key code, and the kind of additional information. the value (0-31) of a key code is assigned to music relations (text) -- the (32-63) -- it is assigned to URL (Uniform Resource Locator) (Web relations). Text, such as an album title, an artist name, and CM, is recorded as additional information.
[0087]Drawing 15 shows an example of correspondence of the value (64-127) of an additional information key code, and the kind of additional information. the value (64-95) of a key code -- path/-- receiving in addition to this and being assigned -- the (96-127) -- it is assigned to control / numerical value, and data relations. For example, additional information is made into TOC-ID in the case of (ID=98). TOC-ID shows the first music number, the last music number, the music number and total performance time, and its music performance time based on the TOC information of CD (compact disk).
[0088]Drawing 16 shows an example of correspondence of the value (128-159) of an additional information key code, and the kind of additional information. The value (128-159) of the key code is assigned to synchronous reproduction relations. EMD (Electronic Music Distribution) in drawing 16 means electronic music distribution.
[0089]The example of the data of additional information is explained with reference to drawing 17. Drawing 17 (a) shows the data configuration of additional information like drawing 13. The additional information by which drawing 17 (b) is set to key code ID=3 is an example of an artist name. It is referred to as SIZE=0x1C (28 bytes), and it is shown that the data length of this additional information containing a header is 28 bytes. C+L is used as the character code C= 0x01, and let it be the linguistic code L= 0x09. According to the regulation mentioned above, this value is a character code of ASCII and shows that it is an English language. And the data of the artist name of "SIMON&GRAFUNKEL" is written from a head that the 12th byte to 1 byte data are also. Since the size of additional information is decided to be 4 bytes of integral multiple, 1 byte of remainder is set to (0x00).
[0090]The additional information by which drawing 17 (c) is set to key code ID=97 is an example of ISRC (International Standard Recording Code: copyright code). It is referred to as SIZE=0x14 (20 bytes), and it is shown that the data length of this additional information is 20 bytes. C+L is set to C= 0x00 and L= 0x00, and it is shown that there is no setting out of a character and a language, i.e., data is a binary number. And the code of 8 bytes of ISRC is written as data. ISRC shows copyright information (a country, an owner, a sound recording year, a serial number).
[0091]The additional information by which drawing 17 (d) is set to key code ID=97 is an example of sound recording time. It is referred to as SIZE=0x10 (16 bytes), and it is shown that the data length of this additional information is 16 bytes. C+L is set to C= 0x00 and L= 0x00, and it is shown that there is no setting out of a character and a language. And 4 bytes (32 bits) of code is written as data, and sound recording time (at a year, the moon, a day, the time a part, a second) is expressed.
[0092]The additional information by which drawing 17 (e) is set to key code ID=107 is an example of

a reproduction log. It is referred to as SIZE=0x10 (16 bytes), and it is shown that the data length of this additional information is 16 bytes. C+L is set to C= 0x00 and L= 0x00, and it is shown that there is no setting out of a character and a language. And 4 bytes (32 bits) of code is written as data, and a reproduction log (at a year, the moon, a day, the time a part, a second) is expressed. The thing with a reproduction log function records 16 bytes of data for every one reproduction.
[0093]3-5 Data file drawing 18 shows the data array of ATRAC3 data file (A3Dnnnn) in case 1SU is N byte (for example, N= 384 bytes). The block as an attribute header and the block with which music data is actually recorded are shown in drawing 18 as a data file as shown by drawing 8. The byte (0x0000-0x7FF0) of the head of each slot of each block (16x2=32 K byte) is shown in drawing 18.
[0094]As shown in drawing 18, 32 bytes is used as a header from the head of an attribute header, 256 bytes is track name field NM1 (256 bytes), and 512 bytes is track name field NM2 (512 bytes). The following data is written to the header of an attribute header.
[0095]BLKID-HD0 (4 bytes)
semantic : -- BLOCKID FILE ID function: -- the value for identifying that it is a head of ATRAC3 data file.
Value: Fixed value ="HD=0" (for example, 0x48442D30)
MCode (2 bytes)
Meaning: The code which identifies the maker of the apparatus which MAKER CODE-functioned, : was recorded, and a model.
Value: 10 bits (manufacturer code) of higher ranks 6 bits (model code) of low ranks
BLOCK SERIAL (4 bytes)
Meaning: The sequence number attached for every track
Function: Even if the head of a block begins from 0 and increment edit of the following block is carried out every [1 / +], don't change a value.
Value: Start from zero and it is to 0xFFFFFFFF.
[0096]N1 C+L (2 bytes)
semantic : -- attribute function [of track (track name) data (NM1)]: -- it expresses each with 1 byte the character code and linguistic code which are used for NM1.
Value: Same Nas SN1 C+L2 C+L (2 bytes)
semantic : -- attribute function [of track (track name) data (NM2)]: -- it expresses each with 1 byte the character code and linguistic code which are used for NM2.
Value: The same INFSIZE as SN1 C+L (2 bytes)
semantic : -- size function: which totaled all the additional information about a track -- data size -- the size of a 16-byte unit -- description. When there is nothing, it is certainly considered as all zero.

Value: Size is 0x0000 to 0x3C6 (966).
T-PRT (2 bytes)
semantic : -- total number-of-multipart-forms function: -- the number of multipart forms which constitutes a track is expressed. Usually, 1.
Value: From 1 to 0x285 (645dec)
T-SU (4 bytes)
semantic : -- several total SU(s) ability: -- the actual total SU number in 1 track is expressed. It is equivalent to the performance time of music.
Value: 0x01 to 0x001FFFFFINX (2 bytes) (Option)
semantic : -- relative place function [of INDEX]: -- the pointer in which the head of the portion (characteristic portion) of the rust of music is shown. The position from the head of music is specified by the number which carried out the number of SU 1/4. This is equivalent to time (about 93 m seconds) 4 times the length of the usual SU.
Value: 0 to 0xFFFF (maximum, about 6084 seconds)

XT (2 bytes) (Option)
semantic : -- regeneration time function [of INDEX]: -- the number of SU of the time which should be reproduced from the head specified by INX-nnn is specified by the number carried out 1/4. This is equivalent to time (about 93 m seconds) 4 times the length of the usual SU.
Value: 0x0000:setting [no] up. 0x01 to 0xFFFE(a maximum of 6084 seconds)0xFFFF: Up to the end of music.
[0097]Next, the track name fields NM1 and NM2 in an attribute header are explained.
[0098]NM1 meaning: -- character string function: showing a track name -- 1 byte of character code -- a table -- the track name (it is 256 at the maximum) of bottom variable length. The end of name data certainly writes in a terminal code (0x00). Size is calculated from this terminal code. When there is no data, 1 bytes or more of null (0x00) is recorded from a head (0x0020) at least.
value: -- character code NM2 various meaning: -- character string function: showing a track name -- 2 bytes of character code -- a table -- the name data (it is 512 at the maximum) of bottom variable length. The end of name data certainly writes in a terminal code (0x00). Size is calculated from this terminal code. When there is no data, 2 bytes or more of null (0x00) is recorded from a head (0x0120) at least.
Value: Various character codes.
[0099]80 bytes of data which begins from the fixed position (0x0320) of an attribute header is called the track information field TRKINF, and security relations and copy control-related information is mainly managed collectively. The data in TRKINF is explained below according to arrangement order.

[0100]CONTENTS KEY (8 bytes)
Meaning: With the value prepared for every music, after being protected by the security block of a memory card, it is saved.
Function: When reproducing music, it becomes the first first needed key. It is used at the time of C-MAC[n] calculation.
Value: It is C-MAC [n] (8 bytes) to 0 to 0xFFFFFFFFFFFFFFFF.
semantic : -- copyright information alteration check value function: -- the value which hides with the contents of two or more TRKINF(s) including a contents accumulation number, and is created from a sequence number. A hidden sequence number is a sequence number currently recorded on the hiding field of the memory card. The recorder which is not copyright correspondence cannot read a hidden field. The personal computer which carries the application which makes it possible to read the recorder of copyright correspondence for exclusive use or a memory card can access a hidden field.
[0101]A (1 byte)
semantic : -- attribute function [of a part]: -- with reference to value:drawing 19 in which information, including the compressed mode in a part, etc., is shown, it explains below, however, as for the monophonic recording of N= 0 and 1, bit7 specifies 0 and the special Joint mode of only a main signal (L+R) for a sub signal as a monophonic recording by 1. The information on bit2 and 1 may disregard the usual reproduction machine.
[0102]The bit 0 of A forms the information on ON and OFF of an emphasis, the bit 1 forms the information on reproduction SKIP and ordinary reproduction, and the bit 2 forms the information on data section, for example, audio information, and other data of FAX etc. The bit 3 is an undefined. Rate information is prescribed by by combining the bits 4, 5, and 6 like a graphic display. N is a value of the rate expressed with this triplet, and Namely, mono- (N= 0, 1), The record time (in the case of 64 MB of memory card), the data transfer rate, SU number in 1 block, and the number of bytes of 1SU are shown, respectively about five kinds of modes of LP gas (N= 2), SP (N= 4), EX (N= 5, 6), and HQ (N= 7). As for the bit 7, the mode (0:Dual 1:Joint) of ATRAC3 is shown.
[0103]As an example, 64 MB of memory card is used and the case of an SP mode is explained. There are 3968 blocks in 64 MB of memory card. In an SP mode, since 1SU is 304 bytes, 53SU

exists in 1 block. 1SU is equivalent to a second (1024/44100). Therefore, 1 block of transfer rates serve as x(44100/1024) 304x8=104737 bps for x(1024/44100) 53x(3968-16) = 4863-second = 81 minutes.
[0104]LT (1 byte)
Meaning: A reproduction restriction flag (the bit 7 and the bit 6) and a security version (the bit 5 - the bit 0)
Function: Mean that there are limitations about this track.
Value: Bit 7: With no 0= restrictions Bit 6 with 1= restriction: Inside of 0= term 1= expiration bit 5 - the bit 0: Security version 0 (if it is except zero, it will be considered as reproduction inhibit).
FNo (2 bytes)
Meaning: File number
Function: It is a track number when recorded first, and this value pinpoints the position of the value of MAC calculating recorded on the hiding field in a memory card.
Value: From 1 to 0x190 (400)
MG(D) SERIAL-nnn (16 bytes)
Meaning: The serial number of a security block (security IC20) of a recording device.
Function: A peculiar value which is altogether different for every recording device.
Value: From 0 to 0xFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFCONNUM (4 bytes)
Meaning: Contents accumulation number
Function: It is managed by the security block of a recording device with the peculiar value accumulated for every music. 2 is prepared by 4,200 million music the 32nd power, and it is used for the recorded discernment of music.
[0105]Value: 0 to 0xFFFFFFFF.
[0106]YMDhms-S (4 bytes) (Option)
semantic : -- the time of the reproduction opening day of a track with reproduction restrictions --
function: -- the time to which the reproduction start specified by EMD is permitted.
Value: It is the same as the notation of the time mentioned above.
YMDhms-E (4 bytes) (Option)
semantic : -- the time of the reproduction end date of a track with reproduction restrictions --
function: -- the time which ends the reproducing permission specified by EMD.
Value: It is the same as the notation of the time mentioned above.
MT (1 byte) (Option)
semantic : -- maximum function [of the number of times of a reproducing permission]: -- the maximum reproduction frequency specified by EMD.
value: -- 1 to 0xFF -- when intact, it is 0x00. The value of MT is set to 00 when the value of bit7 of LT is 0.
CT (1 byte) (Option)
semantic : -- reproduction frequency function: -- the number of times actually renewable among the number of times by which the reproducing permission was carried out. A decrement is carried out to a reproductive degree.
value: -- 0x00 - 0xFF -- when intact, it is 0x00. bit7 of LT forbids reproduction, when the value of CT is 00 in 1.
[0107]CC (1 byte)
semantic : -- COPY CONTROL function: -- copy control value: -- as shown in drawing 20, the bits 6 and 7 express copy control information, the bits 4 and 5 express the copy control information about a high-speed digital copy, and the bits 1, 2, and 3 express a copy attribute. The bit 0 is an undefined.
example [of CC]: -- The bit 7 ... 0: -- Copy prohibition and 1:copy permission bit 6 ... 0:original copy. 1: The 1st [or more] generation bit 5, 4...00 : it is shown that they are copy prohibition, the 1st generation of 01:copy, 10:copy good bits 3 and 2, and the contents recorded from the

1001:original source.
010: It is shown that they are the contents copied from LCM.
011: It is shown that they are the contents which carried out the move from LCM.
100 or more: Undefined.
LCM is Licensed Compliant Module, for example, a personal computer, HDD in consumer apparatus, etc. correspond. For example, to the digital sound recording from CD, as for bit3, and (2, 1), 01, (bit5, and 4) becomes 001 or 010, as for (bit7 and 6). [00, and]
[0108]CN (1 byte) (Option)
semantic : -- number-of-times function of copy permission: in the high-speed digital copy HSCMS (High speed Serial Copy ManagementSystem) -- copy[one copy and]-free -- that distinction is extended and it specifies by the number of times. Only in the 1st generation of a copy, it is effective, and subtracts for every copy.
value: -- 00: -- copy prohibition, the number of times of 0xFE: from 01, and the number of times of 0xFF: -- unrestricted.
[0109]In the attribute header in a data file, PRTINF is arranged in when 24 bytes of data which begins from 0x0370 is called the part information field PRTINF for part management following the above track information fields TRKINF and it constitutes one track from two or more parts in order of the time-axis. The data in PRTINF is explained below according to arrangement order.
[0110]PRTSIZE (4 bytes)
semantic : -- part size function: -- the size of a part is expressed. Cluster: 2 bytes (top), start SU:1 byte (higher rank), end SU:1 byte (lowest)
value: -- cluster: -- 1 to 0x1F40 (8000), start SU:0 to 0xA0 (160), and end SU:0 to 0xA0 (160) (however, how to count SU begins from 0, 1, 2, and 0)
PRTKEY (8 bytes)
semantic : -- value function [for enciphering a part]: -- the rule of edit is followed at the time of initial value =0 and edit.
Value: From 0 to 0xFFFFFFFFFFFFFFFFCONNUM0 (4 bytes)
Meaning: The role of ID for making unique the contents accumulation number key function:contents made first.
Value: It is considered as the same value as a contents accumulation number initial value key.
[0111]In the attribute header of ATRAC3 data file, as shown in drawing 18, additional information INF is contained. This additional information is the same as that of additional information INF-S (refer to drawing 12) in a reproduction management file except for the point that the starting position is not fixed. The data of additional information INF begins by making the next of the byte portion (4-byte unit) of the last of one or more parts into a starting position.
[0112]INF meaning: -- additional information data function: about a track -- the variable-length additional information data accompanied by a header. Several different additional information may be put in order. ID and data size are added to each. The additional information data containing each header is the same as additional information INF-S in 4 bytes of unit value:reproduction management file of an integral multiple at a minimum of 16 bytes or more.
[0113]The data of each block with which ATRAC3 data is recorded continues to the above attribute headers. As shown also in drawing 8, a header is added for every block. The data within a block shown in drawing 18 is explained below.
[0114]BLKID-A3D (4 bytes)
semantic : -- BLOCKID FILE ID function: -- the value for identifying that it is a head of ATRAC3 data.
Value: Fixed value ="A3D" (for example, 0x41334420)
MCode (2 bytes)
Meaning: The code which identifies the maker of the apparatus which MAKER CODE-functioned, : was recorded, and a model.

Value: 10 bits (manufacturer code) of higher ranks 6 bits (model code) of low ranks
CONNUM0 (4 bytes)
Meaning: The contents accumulation number made first
function: -- the role of ID for making contents unique -- a value is not changed even if edited.
Value: It is considered as the same value as a contents accumulation number initial value key.
BLOCK SERIAL (4 bytes)
Meaning: The sequence number attached for every track
Function: Even if the head of a block begins from 0 and increment edit of the following block is carried out every [1 / +], don't change a value.
Value: Start from zero and it is to 0xFFFFFFFF.
BLOCK-SEED (8 bytes)
semantic : -- one key function: for enciphering 1 block -- the value which the head of the block generated the random number with the security block of the recording device, and **********ed the continuing block +one time. Since a sound cannot be made while [about 1 second] it is equivalent to 1 block if this value is lost, the same thing as a header and a block end is written doubly. A value is not changed even if edited.
Value: It is 8 bytes of random number the first stage.
INITIALIZATION VECTOR (8 bytes)
Meaning: The value of 8 bytes for which the head of the required initial value function:block began from 0 when enciphering and decrypting ATRAC3 data for every block, and the last of the last SU was enciphered as for the following block. The case from the middle of the block [DEBAIDO / block] uses 8 bytes of the last in front of the start SU. A value is not changed even if edited.
value: -- 0 to 0 xFFFFFFFFFFFFFFFFSU-nnn meaning: -- data function [of a sound unit]: -- the data compressed from 1024 samples differs from the number of bytes outputted by compressed mode. A value is not changed even if edited (the time of an SP mode as an example N= 384 bytes).
Value: The data value of ATRAC3.
[0115]In drawing 18, since it is N= 384, 42SU is written to 1 block. Two slots (4 bytes) of a 1-block head are used as a header, and BLKID-A3D, MCode, CONNUM0, and BLOCK SERIAL are doubly written to the last one slot (2 bytes). Therefore, too much 1-block field M byte (set to 16,384-384x42-16x3=208 (byte).), As mentioned above in this, 8 bytes of BLOCK SEED is recorded doubly.
[0116]4. Recording processing 4-1 One or less example of processing and the example of processing at the time of the recording operation of the contents (music) by the recorder 1 of this example are explained. There is not only record of contents data but the generation or updating of a reproduction management file which is the capacity for 1 block (one cluster) record of the contents to the memory card 40, and it completes it so that I may be understood from the explanation mentioned above. Edit of DEBAIDO of contents, a combine, etc. is realized by renewal of a reproduction management file. Let the recording position (absolute address) of the reproduction management file on the memory card 40 be a different position at every writing for renewal of a reproduction management file. When DEBAIDO edit is performed, it is necessary to newly use one cluster (1 block).
[0117]If record of contents is performed from such a situation to all the capacity of a memory card, the creation or updating of the reproduction management file concerning the recording operation becomes impossible. Or if all the capacity of a memory card including contents and a reproduction management file is used up, it will become what cannot perform edit of DEBAIDO etc. after that. Then, as the capacity of a certain grade is left behind, it is made for record to be completed in this example at the time of recording operation. However, since the capacity of the part of the capacity left behind which can record contents will decrease by such processing, capacity left behind must be made into a suitable quantity.
[0118]When recording the music of average performance time generally, the number of music (the number of contents) of one recording medium (memory card) will be to about 20 music. When FM

broadcasting etc. are part[1 hour]-recorded, the data for 1 hour is treated as one contents. A user performs operation of dividing each music, by DEBAIDO from the recorded broadcast. From these situations, the method which makes 20 cluster (20 blocks) part grade the above-mentioned capacity left behind, for example can be considered high [a possibility that about 20 times of DEBAIDO will be performed]. In the state where the contents of ten music (30 minutes) are already recorded, if a 10 more cluster (10 blocks) part grade is statistically made into the above-mentioned capacity left behind, it can be presumed that it can respond to subsequent DEBAIDO edit etc. mostly. Then, according to the number of contents already recorded, the method which sets up the capacity left behind is also considered at the time of a recording start. Or it may be made to set up the capacity left behind from the relation of the average size and full capacity of contents already recorded. Since a possibility of being edited after that several times becomes high when there are few contents and the size of each of those contents is large in a memory card, if it says roughly, it is suitable if the capacity left behind is set up according to the tendency.

[0119]Anyway, in this example, the capacity left behind is set up according to the possibility of the number of times of edit after record.

[0120]DSP30 of the recorder 1 is inputted from the line-in selector 13 or the digital input selector 16, and the processing at the time of recording the data in which encryption processing was performed by the audio encoder / decoder 10 encoding processing and security IC20 on the memory card 40 is shown in drawing 21.

[0121]When record is started, DSP30 is Step F101 first and distinguishes whether contents (data file) are already recorded on the memory card 40 from the management information (reproduction management file) of the memory card 40 with which it is loaded. When one is the memory card 40 in which the data file is not recorded, processing is advanced to Step F102 and "20" is still set to the variable L. This is because the inclusion state of about 20 music can be considered, and a possibility that about 20 times of DEBAIDO will be performed can usually be considered as mentioned above if it puts in another way. Of course, the value "20" is only an example, and the suitable value should be set up according to the capacity of a memory card, etc. It may enable it to fluctuate the value equivalent to this "20" arbitrarily to compensate for whether a user performs his situation and contents of record, for example, edit, repeatedly.

[0122]And at Step F108, a part for 20 clusters (20 blocks) is secured not much as a block in L cluster, i.e., this case. It is the block count as capacity which is a thing here of the capacity which mentioned the block above not much, and which is left behind, that is, is at the end time of record, and should be left behind.

[0123]When one or more data files are already recorded on the memory card 40, processing of DSP30 computes the average file size M of the data file currently followed and recorded on Step F103. This can compute it, if the capacity already used for record of a data file is divided by the number of data files. If the average file size M is computable, the prediction total file N [several] is computed at Step F104 by breaking the full capacity of the memory card 40 by the average file size M. In the prediction total file N [several], when the full capacity of the memory card 40 is used, it is a predicted value of how many data files are recorded.

[0124]And DSP30 distinguishes whether the prediction total file N [several] is below "20" at Step F105. "20" here is used as the number of inclusion music as a general average, and is not limited to "20."

[0125]When the prediction total file N [several] is below "20", it judges that 20 music may be recorded, and it is Step F106 and the value which subtracted the number of data files already recorded from "20" is set to the variable L. And at Step F108, a part for L cluster (L blocks) is secured not much as a block.

[0126]On the other hand, when it is presupposed at Step F105 that it is the prediction total file N [several] over "20", Only the number of the prediction total files N [several] is judged that a data file may be recorded, and the value which subtracted the number of data files already recorded from

the prediction total file N [several] at Step F107 is set to the variable L. And at Step F108, a part for L cluster (L blocks) is secured not much as a block.

[0127]If a block is set up not much as Step F108, record of the data file by audio information will be started from Step F109. Having mentioned the data file above will be recorded by the block unit.

[0128]During recording operation, it is Step F110, and it is supervising whether except for the block, the recordable remaining capacity in the memory card 40 became zero not much. In Step F111, whether the record of 1 or two or more data files which the end of record, i.e., a user, directed was completed, when the user performed recording stop operation from the final controlling element 39, it is supervised whether it became that by which record is ended. Furthermore, at Step F112, as audio information currently supplied, a file change, i.e., music, changes and it is supervised whether it will shift to record of another data file. This file change, i.e., change of music, becomes possible under supervising the track number information included in that digital data etc., when music is supplied as digital audio data, for example from recording media, such as MD and CD. Even when recording about the analog audio signal from the line-in selector 13, it may be made to judge it as a file change, for example by detection of a silent period, etc.

[0129]When it becomes the end of record at Step F111 before rather than an affirmation result comes out at Step F110, DSP30 is Step F118, creates the reproduction management file about the recorded contents (or updating), and finishes recording processing. In this case, the recordable capacity in the memory card 40 is in the state still left behind fully for subsequent record or edit.

[0130]When the file change about the audio information recorded at Step F112 during recording operation is detected, it is the block with which the audio information to the file change point was recorded, and one data file will be formed. Then, the decrement of the variable L is carried out at Step F113, at the time, if the variable L is larger than "1", it will return to Step F108, and a part for L cluster is secured not much as a block. That is, 1 block of setting out as a block is lessened not much. This is that one data file was recorded and is because it is possible that the possibility of the subsequent number of times of DEBAIDO decreased once. And subsequent record is performed after making continuing audio information into the head of a new block as a new data file from Step F109.

[0131]If a track change is detected 19 times during record, when it is Step F114, it will become the variable L= 0. And this is a case where the continuing audio information is recorded as the 20th music. In this case, since a possibility that DEBAIDO edit will be performed after sound recording will become very low, Although considering only it a block may be kept not much as zero according to becoming the variable L= 0, since the writing of a playback management file is actually needed after sound recording, it is at least at the end time of sound recording, and 1 block must be left behind. Then, when the variable L becomes less than one (that is, 0) at Step F114, it is Step F116 and at least 1 block is secured not much as a block at Step F108 as the variable L= 1. Subsequent edit cannot be performed, if a block is used not much for the writing of the reproduction management file after the end of record in this case and the full capacity of the memory card 40 is consumed by it. So, in Step F115, it is shown that there is a possibility that the edit after the end of record may become impossible to a user. For example, a message to that effect is displayed on the indicator 33. However, since record or edit is still possible when judged as the end of record at Step F111 (i.e., when the block not much recordable besides a block is left behind) before an affirmation result comes out at Step F110 after that, it is not necessary to necessarily perform an alarm display at this time.

[0132]In Step F110, it leaves the block count set up not much as area at the time, and when it is judged that the block recordable on others has been used up, it progresses to Step F117 and DSP30 suspends recording operation compulsorily. And the reproduction management file about the contents recorded at Step F118 is created (or updating), and recording processing is finished. In this case, the recordable capacity in the memory card 40 is in the state where only the block count set up not much as area is left behind. And the block count as a block is set up not much according to

the recorded number of music already being subtracted etc. from the thing [that 20 music is usually recorded], that the number of inclusion music is presumed from the relation between average data size and full capacity, and those numbers of inclusion music to have mentioned above. If music is furthermore divided during record (file change), the decrement of the block count is carried out not much. It is at the end time of record, and the number of times only of edit generally predicted after that at least turns into the block count which is sufficient for making edit possible from these things. Therefore, even when sensing that the user has used up the recordable area of the memory card 40 at the time of contents recording, edit of the number of times which is usually needed at least will be enabled, and does not make a user stop sensing inconvenience. The block count is set up not much as the minimum number of times in the number of times of edit usually needed according to a contents recording situation by the block count being set up not much according to the variable L as mentioned above, and a decrement being carried out during record by one side. This means being seldom what sets up many block counts too much and makes record possible capacity of contents small more than needed by that cause. That is, by the recording processing of this example, if possible, after making it not decrease the storage capacity of contents, the edit needed after that can be changed into the state which can be performed.

[0133]After Step F110 is ended after the block has decreased to 1 block not much as mentioned above, and record is ended by F117, it becomes what is used for record of a reproduction management file, and its block and 1 block carried out not much of all the blocks serve as used at the time. That is, edit is impossible henceforth. (According to the view of this example, in this case, since it is already divided into 20 or the number of music beyond it, it is in the state where there is no necessity for DEBAIDO edit). Then, in such a case, it may be made to perform the warning process explained as Step F115. At the time, the edit prohibition process which repeals editing operation may be performed. When a reproduction management file is not newly recorded on a certain block but an old reproduction management file "is updated" in this case, the block with which the old reproduction management file was recorded turns into a block which can be written in. Therefore, a combine, a move, erasion, etc. are possible for the edit realized only by renewal of a reproduction management file. Then, in such a case, the above-mentioned warning and an edit prohibition process may be performed as what was restricted to DEBAIDO edit.

[0134]By the way, although explanation of the above processing also explained the block used for the writing of the reproduction management file in Step F118 at the end time of record as what is secured not much as a block at least, It may consider processing of drawing 21 that the block used for the writing of the reproduction management file in Step F118 is secured apart from "blocking not much." In that case, even if Step F110 is ended after the block has decreased to 1 block not much as mentioned above, record is ended by F117 and record of a reproduction management file is performed, a block and 1 block carried out are left behind not much. Therefore, a combine, a move, erasion, etc. are possible for the edit realized only by renewal of a reproduction management file. Since the block with which the old reproduction management file was recorded is also can be written in when a reproduction management file is updated, 2 blocks can be written in and DEBAIDO is also possible. Therefore, as for the above-mentioned alarm display or an edit prohibition process, it is preferred to carry out according to these situations.

[0135]Although it was made for the block count to decrease simply not much in the example of processing of drawing 21 according to the file change, As block setting out is performed including the data file formed by the audio information to the timing of a file change just because it responded to the average file size and full capacity like Steps F103-F107, it may be made for setting out of the block to change not much.

[0136]4-2 Continue example of processing 2 and drawing 22 explains the recording processing as the example 2 of processing. In drawing 22, about the same processing as above-mentioned drawing 21, the same step number is attached as Steps F101-F118, and explanation is omitted. That is, as for this example 2 of processing, Steps F100 and F119 - 121 are added to processing of above-

mentioned drawing 21.
[0137]In this case, in order to enable a user's edit after record, it enables it to choose whether record possible capacity of contents is increased as much as possible, without seldom taking whether a block is set up and such a thing into consideration. That is, the operational mode which a user makes end recording operation by operation from the final controlling element 39 for example when the recordable block residue except the amount of blocks serves as zero not much, It enables it to choose the operational mode (using-up setting out) which enables continuation of recording operation until a block residue recordable on the memory card 40 serves as zero.
[0138]When a user makes record start without performing using-up setting out, the recording processing of DSP30 turns into the same processing as drawing 21 (F101-F118). However, when it sets up by the user having used up and recording operation is made to start, DSP30 performs processing of Step F119, F120, and F121. That is, record of the data file by audio information is started from Step F119. The data file will be recorded by the block unit.
[0139]And during recording operation, it is Step F120, and it is supervising whether the recordable remaining capacity in the memory card 40 remained, and it became 1 block. In Step F121, whether the record of 1 or two or more data files which the end of record, i.e., a user, directed was completed, when the user performed recording stop operation from the final controlling element 39, it is supervised whether it became that by which record is ended. As audio information currently supplied during record, when a file change is detected, it is the block with which the audio information to the file change point was recorded, and one data file is formed. And subsequent record is performed after making continuing audio information into the head of a new block as a new data file.
[0140]When it becomes the end of record at Step F121 before rather than an affirmation result comes out at Step F120, DSP30 is Step F118, creates the reproduction management file about the recorded contents (or updating), and finishes recording processing. In this case, the recordable capacity in the memory card 40 is in the state still left behind fully for subsequent record or edit.
[0141]In Step F120, it leaves 1 block count at the time, and when it is judged that the recordable block has been used up, it progresses to Step F117 and DSP30 suspends recording operation compulsorily. And at Step F118, the reproduction management file about the recorded contents is created to the remaining 1 blocks (or updating), and recording processing is finished. In this case, it means that the recordable capacity in the memory card 40 was used for record of the maximum and contents. That is, in this example 2 of processing, if it is a case where the edit after record is not considered, it can be made to carry out by a user's selection at record of contents the maximum use of the capacity of the memory card 40.
[0142]4-3 The example 3 of processing is shown in example of processing 3 drawing 23. This example of processing is what fixed setting out of the block not much, and is an example of a fixed value secured as the block count as a block being recordable not much at least at the end time of record.
[0143]That is, when record is started, DSP30 is Step F201 and sets up a part for x cluster as a block not much as a certain set-up fixed value. And record of the data file by audio information is started from Step F202. The data file is recorded by the block unit.
[0144]And the remaining capacity in which it is Step F203 during recording operation, and the record in the memory card 40 is possible, Supervise [x] whether except for the block, it became zero not much, and in Step F204. Whether the record of 1 or two or more data files which the end of record, i.e., a user, directed was completed, when the user performed recording stop operation from the final controlling element 39, it is supervised whether it became that by which record is ended. As audio information currently supplied during record, when a file change is detected, it is the block with which the audio information to the file change point was recorded, and one data file is formed. And subsequent record is performed after making continuing audio information into the head of a new block as a new data file.

[0145]When it becomes the end of record at Step F204 before rather than an affirmation result comes out at Step F203, DSP30 is Step F206, creates the reproduction management file about the recorded contents (or updating), and finishes recording processing. In this case, the recordable capacity in the memory card 40 is in the state still left behind fully for subsequent record or edit.
[0146]In Step F203, it leaves x block count at the time, and when it is judged that the recordable block has been used up, it progresses to Step F205 and DSP30 suspends recording operation compulsorily. And at Step F206, the reproduction management file about the recorded contents is created using one of x blocks (or updating), and recording processing is finished. In this case, it will be in the state where a part set up not much as a block as recordable capacity in the memory card 40 blocked (x−1) was left behind.
[0147]That is, in this example 3 of processing, it is at the end time of record, and blocked capacity is left behind at least (x−1), and subsequent editing becomes possible only for that part. It is good also as a value statistically considered to be appropriate as a value of x set up fixed, for example, and as a user can set up arbitrarily, for example, processing corresponding to the user's situation and contents of record can be performed.
[0148]As mentioned above, although the example as an embodiment of the invention has been explained, the example of an embodiment is an example to the last, and the composition of a recorder, mode of processing, etc. are considered variously. The setting method of the block count can consider various kinds of various modifications not much especially. Although the above-mentioned example explained supposing the contents (program) as audio information, this invention is completely applicable to the contents as a video data similarly. The same may be said of text data and other contents.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a block diagram of the recorder of an embodiment of the invention.
[Drawing 2]It is a block diagram of DSP of the recorder of an embodiment.
[Drawing 3]It is a block diagram showing the composition of the memory card of an embodiment.
[Drawing 4]It is an explanatory view of the composition of the file system processing hierarchy of the memory card in an embodiment.
[Drawing 5]It is an explanatory view of a format of the physical configuration of the data of the memory card of an embodiment.
[Drawing 6]It is an explanatory view of the directory structure of the memory card of an embodiment.
[Drawing 7]It is an explanatory view of the data configuration of the reproduction management file of the memory card of an embodiment.
[Drawing 8]It is an explanatory view of the data configuration of the data file of the memory card of an embodiment.
[Drawing 9]It is an explanatory view of the composition of the data file of an embodiment.
[Drawing 10]It is an explanatory view of the combine editing processing of the data file of an embodiment.
[Drawing 11]It is an explanatory view of the DEBAIDO editing processing of the data file of an embodiment.
[Drawing 12]It is an explanatory view of the composition of the reproduction management file of an embodiment.
[Drawing 13]It is an explanatory view of the composition of the additional information field of the reproduction management file of an embodiment.
[Drawing 14]It is an explanatory view of the additional information key code of an embodiment.
[Drawing 15]It is an explanatory view of the additional information key code of an embodiment.
[Drawing 16]It is an explanatory view of the additional information key code of an embodiment.
[Drawing 17]It is an explanatory view of the concrete data configuration of the additional information in an embodiment.
[Drawing 18]It is an explanatory view of the composition of the data file of an embodiment.
[Drawing 19]It is an explanatory view of "A" of the attribute header of the data file of an embodiment.
[Drawing 20]It is an explanatory view of "CC" of the attribute header of the data file of an embodiment.
[Drawing 21]It is a flow chart of the recording processing of an embodiment.
[Drawing 22]It is a flow chart of the recording processing of an embodiment.
[Drawing 23]It is a flow chart of the recording processing of an embodiment.
[Description of Notations]

1, 1A, and 1B [A memory card and 42 / A flash memory and 52 / Security block] A recorder and 10 An audio encoder / decoder IC, and 20 Security IC, 30 DSP, and 40

[Translation done.]

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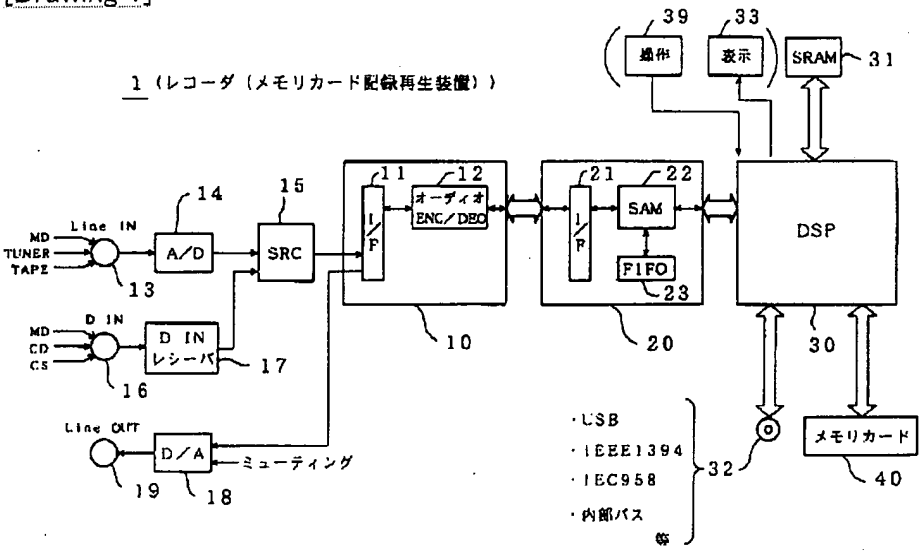
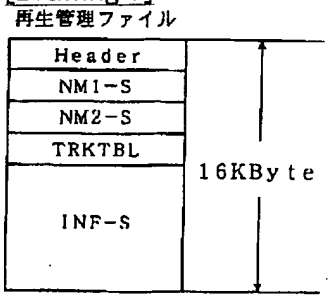
DRAWINGS

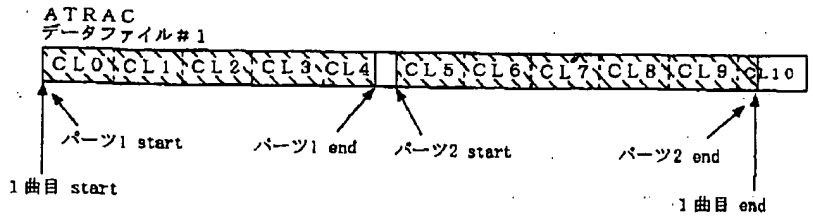
[Drawing 1]



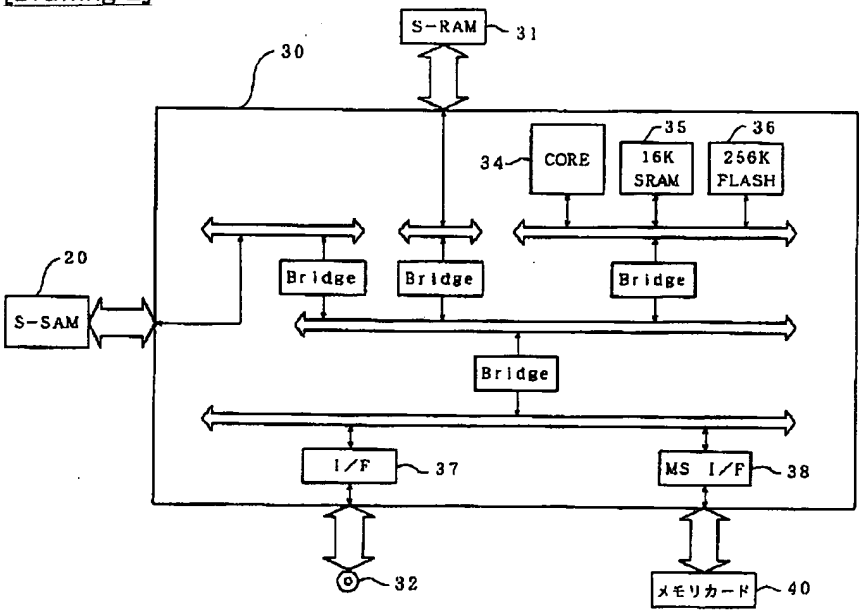
[Drawing 7]



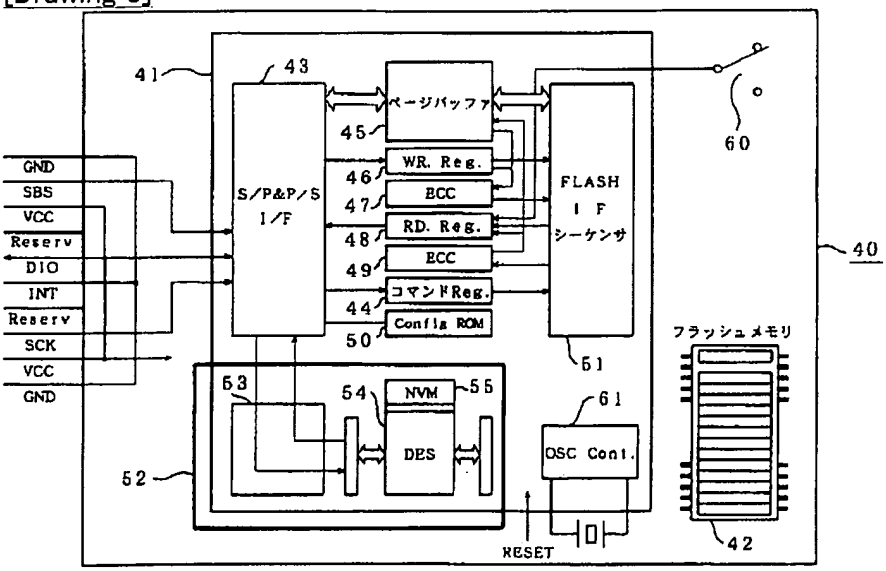
[Drawing 10]



[Drawing 2]



[Drawing 3]

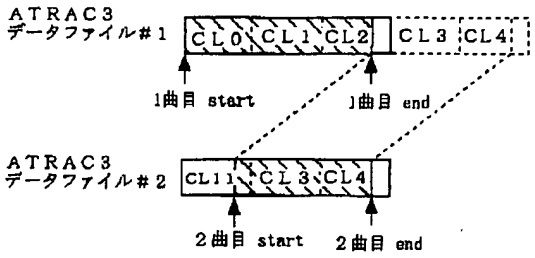


[Drawing 4]

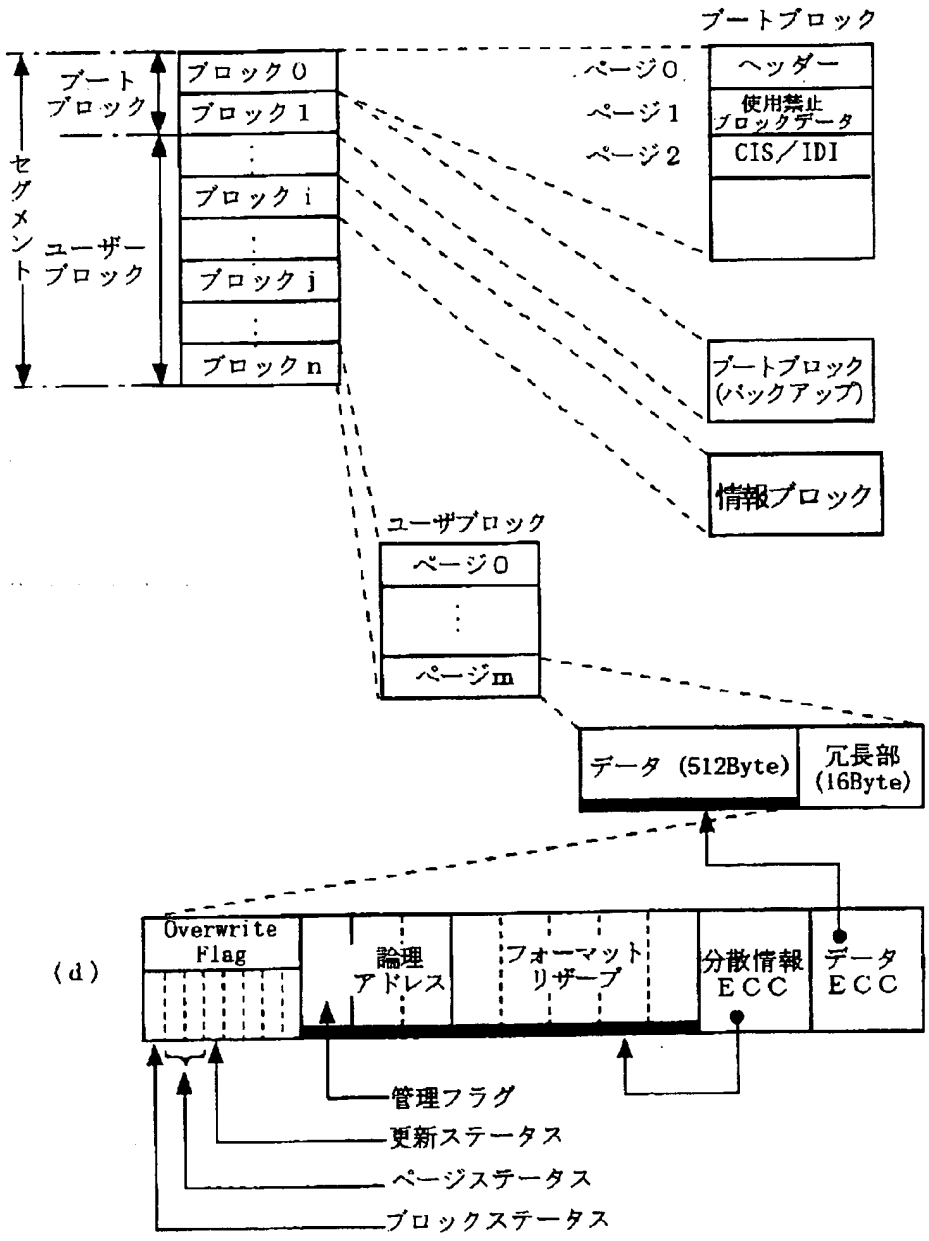
アプリケーション処理
ファイル管理処理
論理アドレス管理
物理アドレス管理
フラッシュメモリアクセス

ファイルシステム処理階層

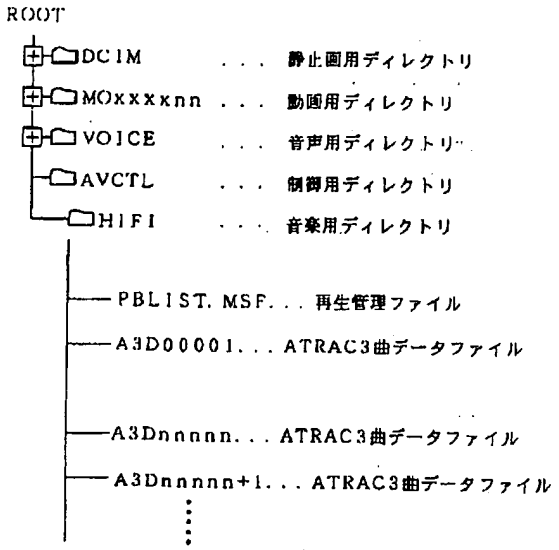
[Drawing 11]



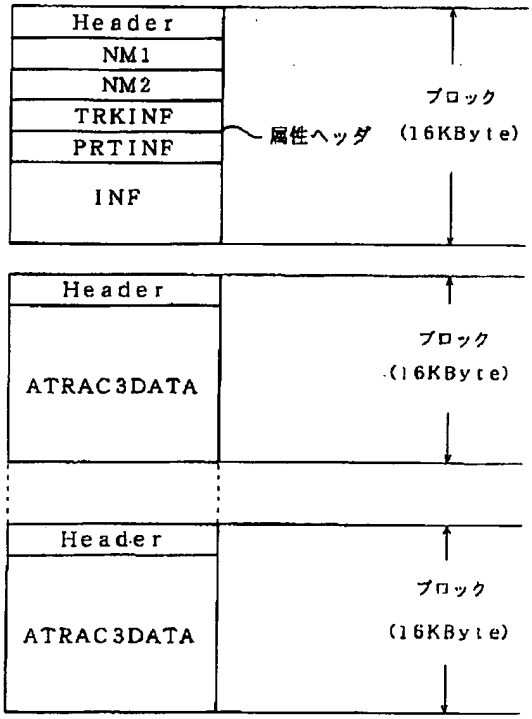
[Drawing 5]


ブートブロック
ブロック0
ブロック1
ブロックi
ブロックj
ブロックn
ブート
ブロック
ユーザー
ブロック
セグメント
ページ0
ページ1
ページ2
ヘッダー
使用禁止
ブロックデータ
CIS/IDI
ブートブロック
(バックアップ)
情報ブロック
ユーザブロック
ページ0
ページm
データ (512Byte)
冗長部
(16Byte)
(d)
Overwrite
Flag
論理
アドレス
フォーマット
リザーブ
分散情報
ECC
データ
ECC
管理フラグ
更新ステータス
ページステータス
ブロックステータス

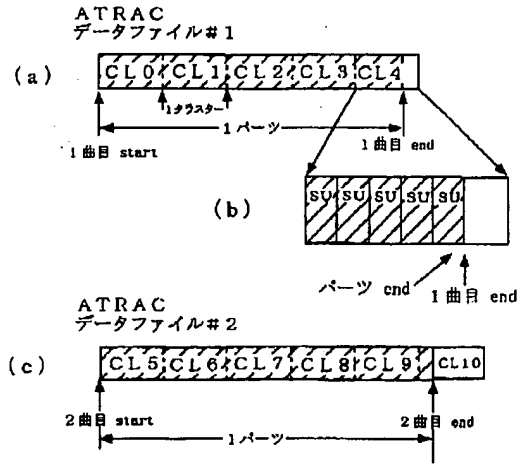
[Drawing 6]



[Drawing 8]
1つのATRAC3曲データファイル



[Drawing 9]

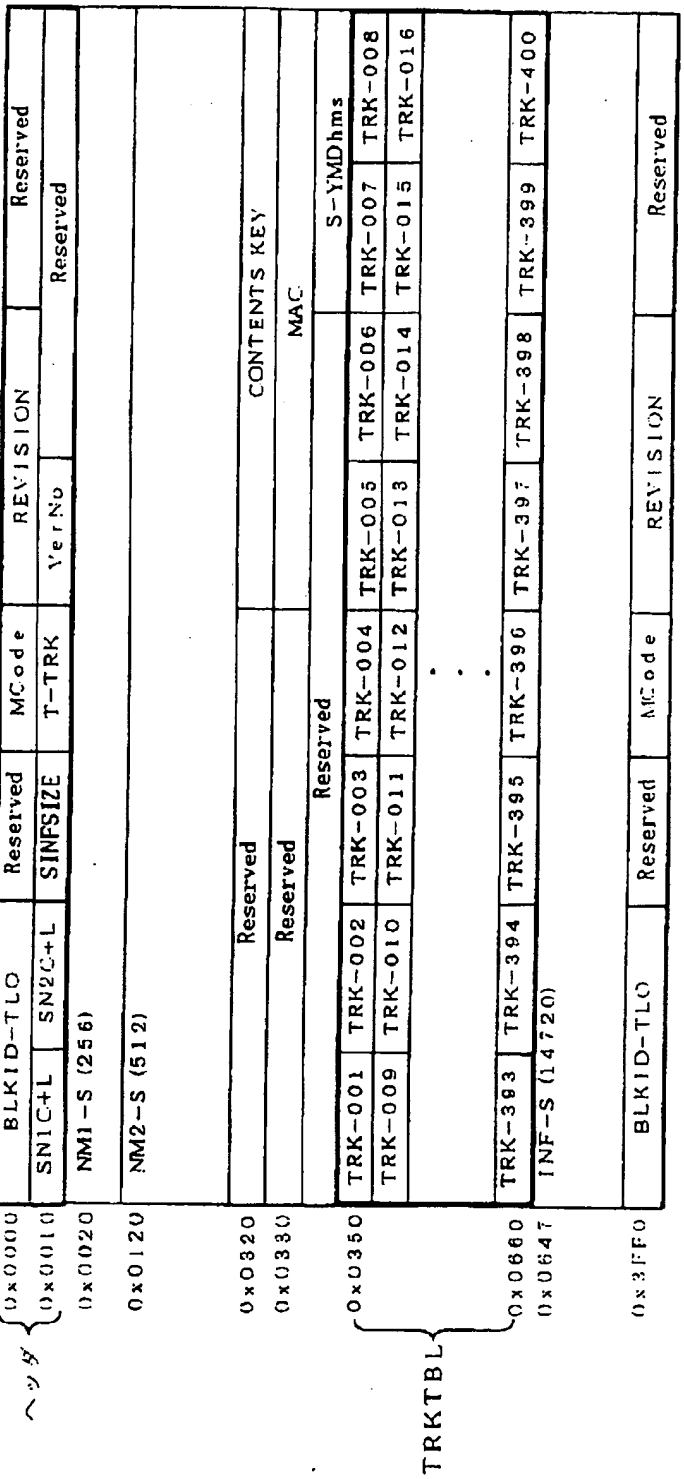


[Drawing 13]

0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
INF	0x00	ID	0x00	SIZE		MCode		C+L		Reserved		DATA可変長			

付加情報データ（INF－S）

[Drawing 12]


再生管理ファイル（PBLIST）
0 1 2 3 4 5 6 7 8 9 A B C D E F
ヘッダ
TRKTBL
0x0000
0x0010
0x0020
0x0120
0x0320
0x0330
0x0350
0x0660
0x0647
0x3FF0
BLKID-TLO
Reserved
MCode
REVISION
SN1C+L
SN2C+L
SINFSIZE
T-TRK
VerNo
Reserved
NM1-S (256)
NM2-S (512)
CONTENTS KEY
MAC
S-YMDhms
TRK-001
TRK-002
TRK-003
TRK-004
TRK-005
TRK-006
TRK-007
TRK-008
TRK-009
TRK-010
TRK-011
TRK-012
TRK-013
TRK-014
TRK-015
TRK-016
TRK-393
TRK-394
TRK-395
TRK-396
TRK-397
TRK-398
TRK-399
TRK-400
INF-S (14720)

[Drawing 14]

付加情報キーコード

ID	音楽関係（文字）		ID	URL（Web関係）	
0	reserved		32	reserved	
1	アルバム	可変	33	アルバム	可変
2	サブタイトル	可変	34	サブタイトル	可変
3	アーティスト	可変	35	アーティスト	可変
4	指揮者	可変	36	指揮者	可変
5	オーケストラ	可変	37	オーケストラ	可変
6	プロデューサ	可変	38	プロデューサ	可変
7	発行・出版社	可変	39	発行・出版社	可変
8	作曲者	可変	40	作曲者	可変
9	作詞者	可変	41	作詞者	可変
10	編曲者	可変	42	編曲者	可変
11	スポンサー	可変	43	スポンサー	可変
12	CM	可変	44	CM	可変
13	解説	可変	45	解説	可変
14	原曲名	可変	46	原曲名	可変
15	原曲アルバム名	可変	47	原曲アルバム名	可変
16	原曲作曲者	可変	48	原曲作曲者	可変
17	原曲作詞者	可変	49	原曲作詞者	可変
18	原曲編曲者	可変	50	原曲編曲者	可変
19	原曲演奏者	可変	51	原曲演奏者	可変
20	メッセージ	可変	52		
21	コメント	可変	53		
22	警告	可変	54		
23	ジャンル	可変	55		
24	文章	可変	66		
25			57		
26			58		
27			59		
28			60		
29			61		
30			62		
31			63		

[Drawing 15]

付加情報キーコード

ID	パス／その他		ID	制御／数値データ関係	
64	Reserved		96	Reserved	
65	画像データへのパス	可変	97	ISRC	8
66	歌詞データへのパス	可変	98	TOC_ID	8
67	MIDIデータへのパス	可変	99	UPC／JAN	7
68	解説データへのパス	可変	100	収録日（YMDhms）	4
69	コメントデータへのパス	可変	101	発売日（YMDhms）	4
70	CMデータへのパス	可変	102	原曲発売日（YMDhms）	4
71	FAXデータへのパス	可変	103	録音日時（YMDhms）	4
72	通信データ1へのパス	可変	104	サブトラック	4
73	通信データ2へのパス	可変	105	平均音量	1
74	制御データへのパス	可変	106	レジューム	4
75			107	再生ログ（YMDhms）	4
76			108	再生回数（学習用）	1
77			109	PASSWORD1	16
78			110	APPLevel	16
79			111	ジャンルコード	2
80			112	MIDIデータ	可変
81	パーツ付加情報	可変	113	サムネール写真データ	可変
82			114	文字放送データ	可変
83			115	総曲数	2
84			116	セット番号	1
85			117	総セット番号	1
86			118	REC位置情報−GPS	可変
87			119	PB 位置情報−GPS	可変
88			120	REC位置情報−PHS	可変
89			121	PB 位置情報−PHS	可変
90	DISC−TOC	可変	122	接続先電話番号1	可変
91			123	接続先電話番号2	可変
92			124	入力値	可変
93			125	出力値	可変
94			126	PB制御データ	可変
95			127	REC制御データ	可変

[Drawing 19]

A

bit	意味	値
7	ATRAC3のモード	0：Dual　　1：Joint
6 5 4	レートの値	N　表示　Time　Rate　SU　Byte 7　HQ　47min　176kbps　31SU　512 6　EX　58min　146kbps　38SU　424 5　EX　64min　132kbps　42SU　384 4　SP　81min　105kbps　53SU　304 3　LP　90min　94kbps　59SU　272 2　LP　128min　66kbps　84SU　192 1　MN　181min　47kbps　119SU　136 0　MN　258min　33kbps　169SU　96 （Nはbit6，5，4の3ビットの値） ＊N＝0，1のモノラルは、bit7が「1」（Joint）で、メイン信号のみの特別なJointモードをモノラルとして規定する
3	Reserved	−
2	データ区分	0：オーディオ　　1：その他
1	再生SKIP	0：通常再生　　1：SKIP
0	エンファシス	0：OFF　　1：ON（50／15μs）

[Drawing 16]

付加情報キーコード

ID	同期再生関係	
128	reserved	
129	同期再生関係1	可変
130	同期再生関係2	可変
131	同期再生関係3	可変
132	同期再生関係4	可変
133	同期再生関係5	可変
134	同期再生関係6	可変
135		
136		
137		
138	EMD関連1	可変
139	EMD関連2	可変
140		
141		
142		
143		
144		
145		
146		
147		
148		
149		
150		
151		
152		
153		
154		
155		
156		
157		
158		
159		

[Drawing 20]

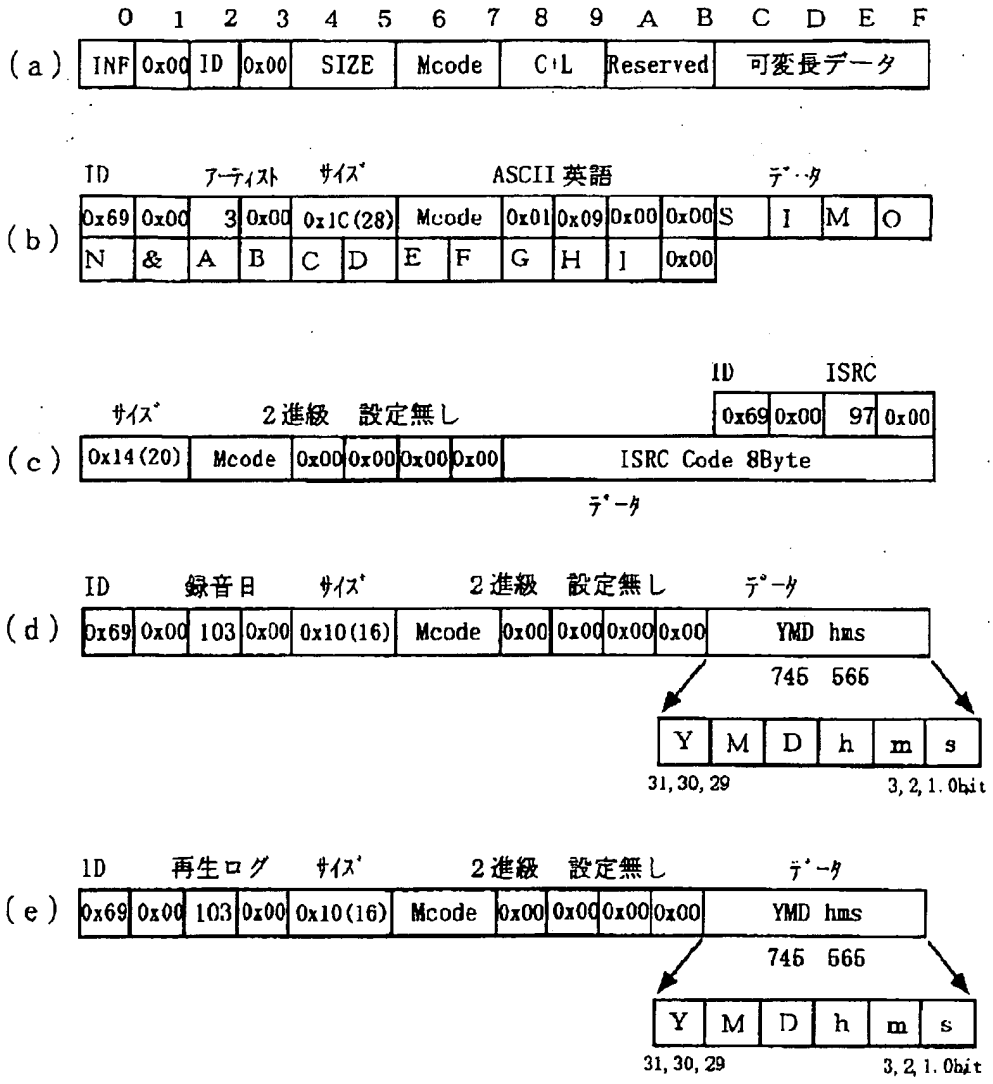
CC

bit	意味		値	
7	コピー制御	コピー可否	0：コピー禁止	1：コピー可
6		世代	0：オリジナル	1：第1世代以上
5 4	高速デジタル コピー制御 (HCMS)		00：コピー禁止 10：コピー可	01：コピー第1世代
3 2 1	コピー属性		000：Reserved 001：オリジナルソースから記録したコンテンツ 010：LCMからコピーしたコンテンツ 011：LCMからムーブしたコンテンツ 100以上：Reserved	
0	Reserved		-	

LCM:Licensed Compliant Module

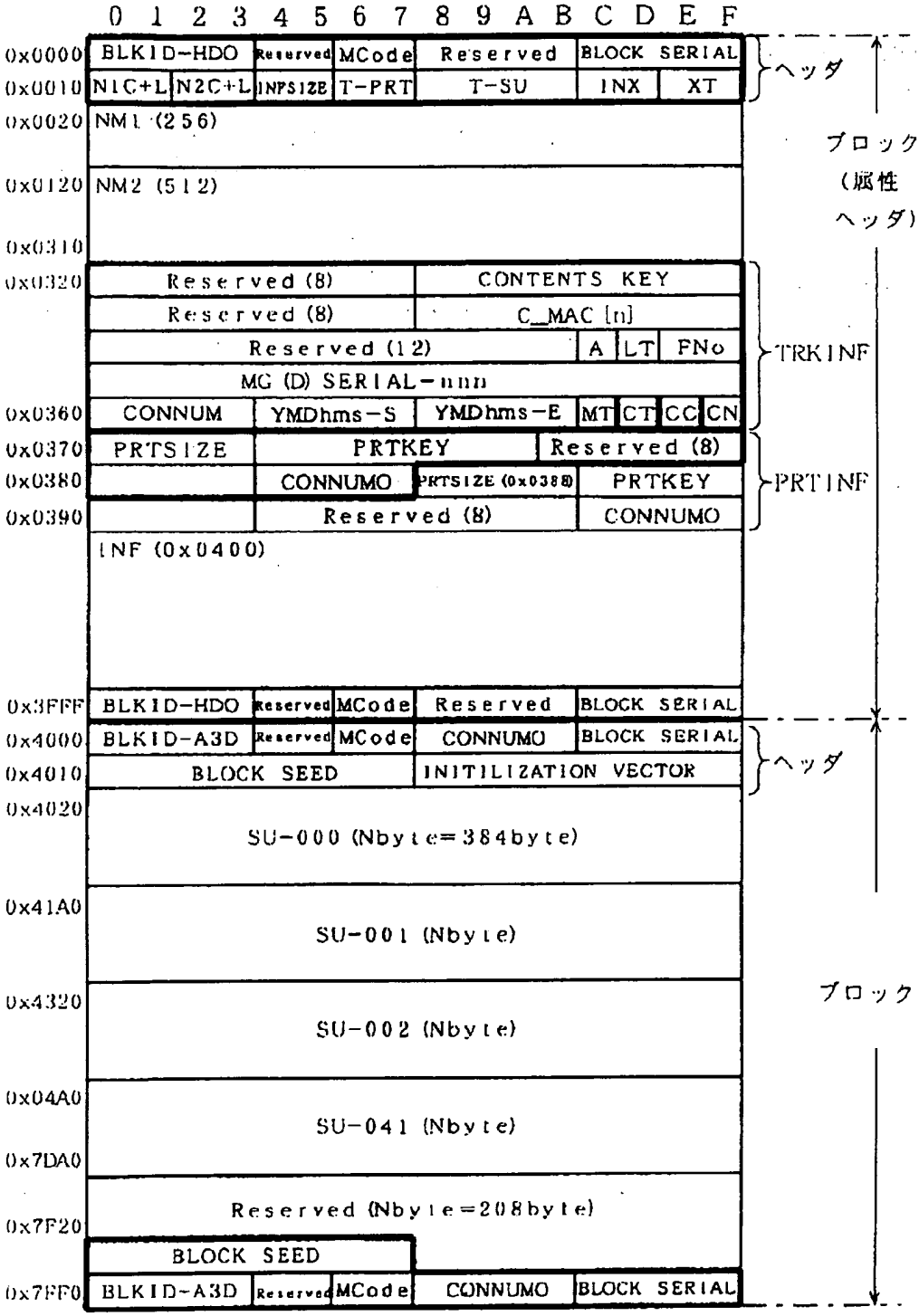
例：PCやコンシューマ機器のHDD等

[Drawing 17]

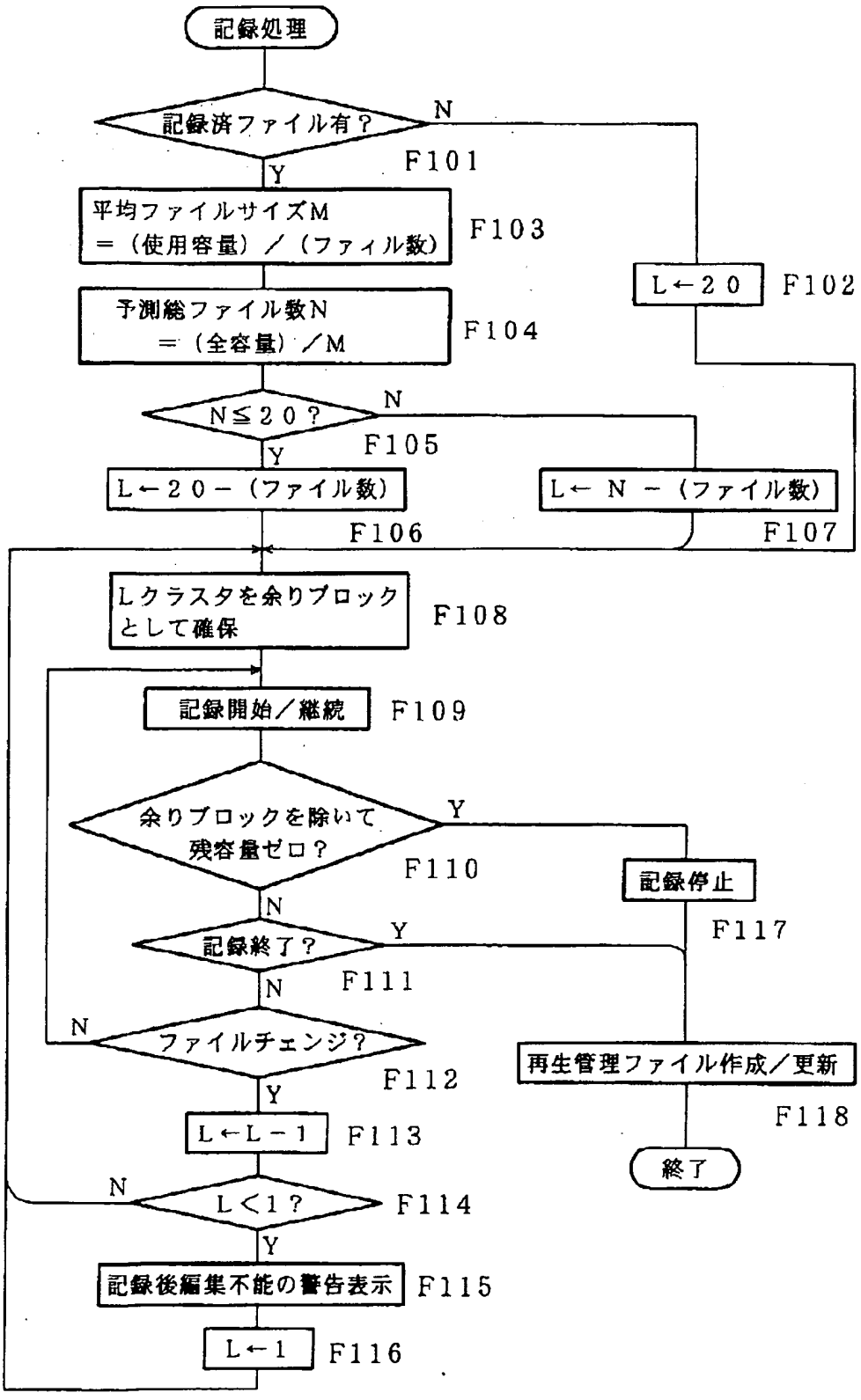

0 1 2 3 4 5 6 7 8 9 A B C D E F
(a)
INF 0x00 ID 0x00 SIZE Mcode CTL Reserved 可変長データ
ID アーティスト サイズ ASCII 英語 データ
(b)
0x69 0x00 3 0x00 0x1C(28) Mcode 0x01 0x09 0x00 0x00 S I M O
N & A B C D E F G H I 0x00
ID ISRC
サイズ 2進級 設定無し
(c)
0x69 0x00 97 0x00
0x14(20) Mcode 0x00 0x00 0x00 0x00 ISRC Code 8Byte
データ
ID 録音日 サイズ 2進級 設定無し データ
(d)
0x69 0x00 103 0x00 0x10(16) Mcode 0x00 0x00 0x00 0x00 YMD hms
745 565
Y M D h m s
31, 30, 29
3, 2, 1. 0bit
ID 再生ログ サイズ 2進級 設定無し データ
(e)
0x69 0x00 103 0x00 0x10(16) Mcode 0x00 0x00 0x00 0x00 YMD hms
745 565
Y M D h m s
31, 30, 29
3, 2, 1. 0bit

[Drawing 18]

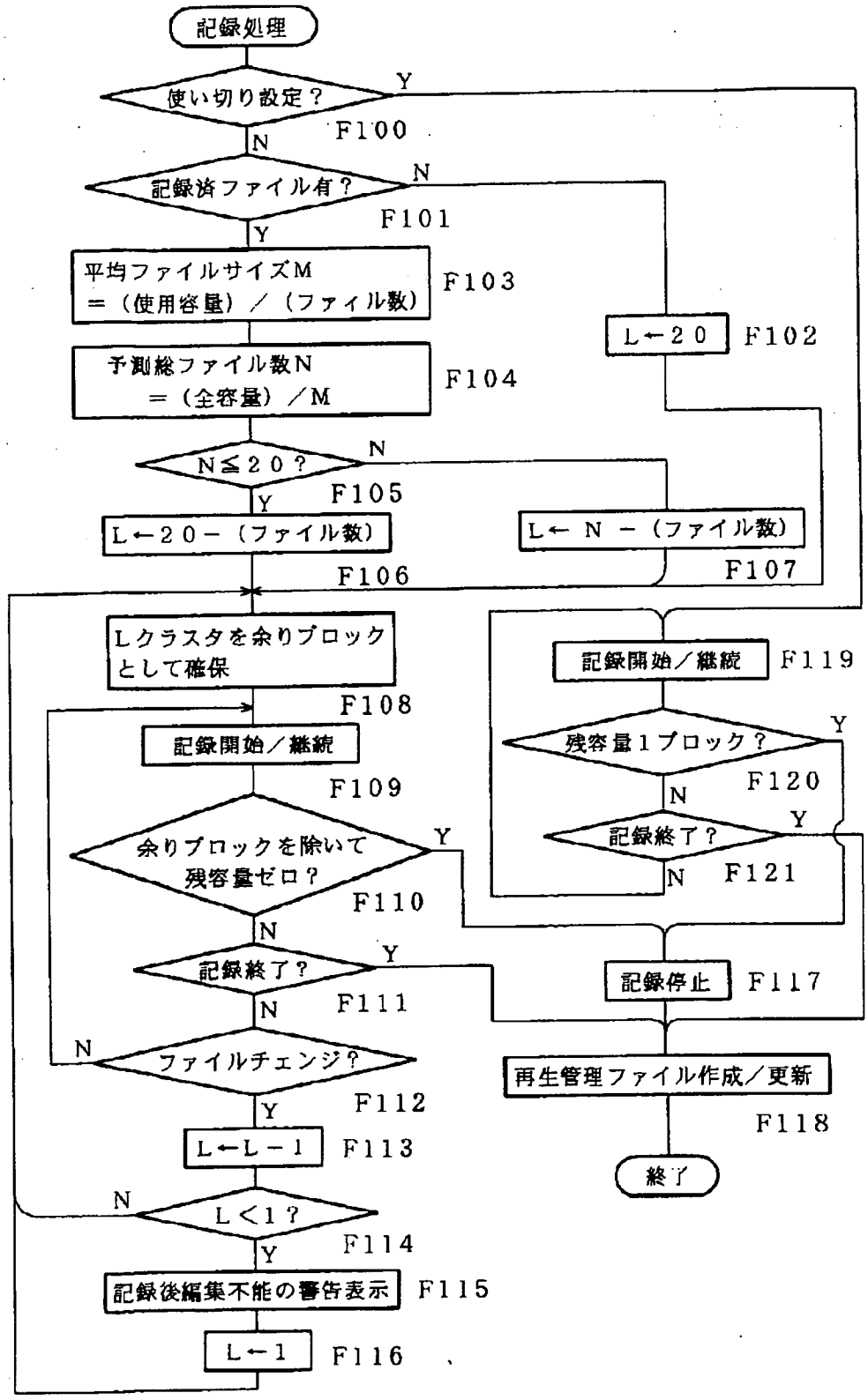
A3Dnnnnn. MSA (ATRAC3データファイル)



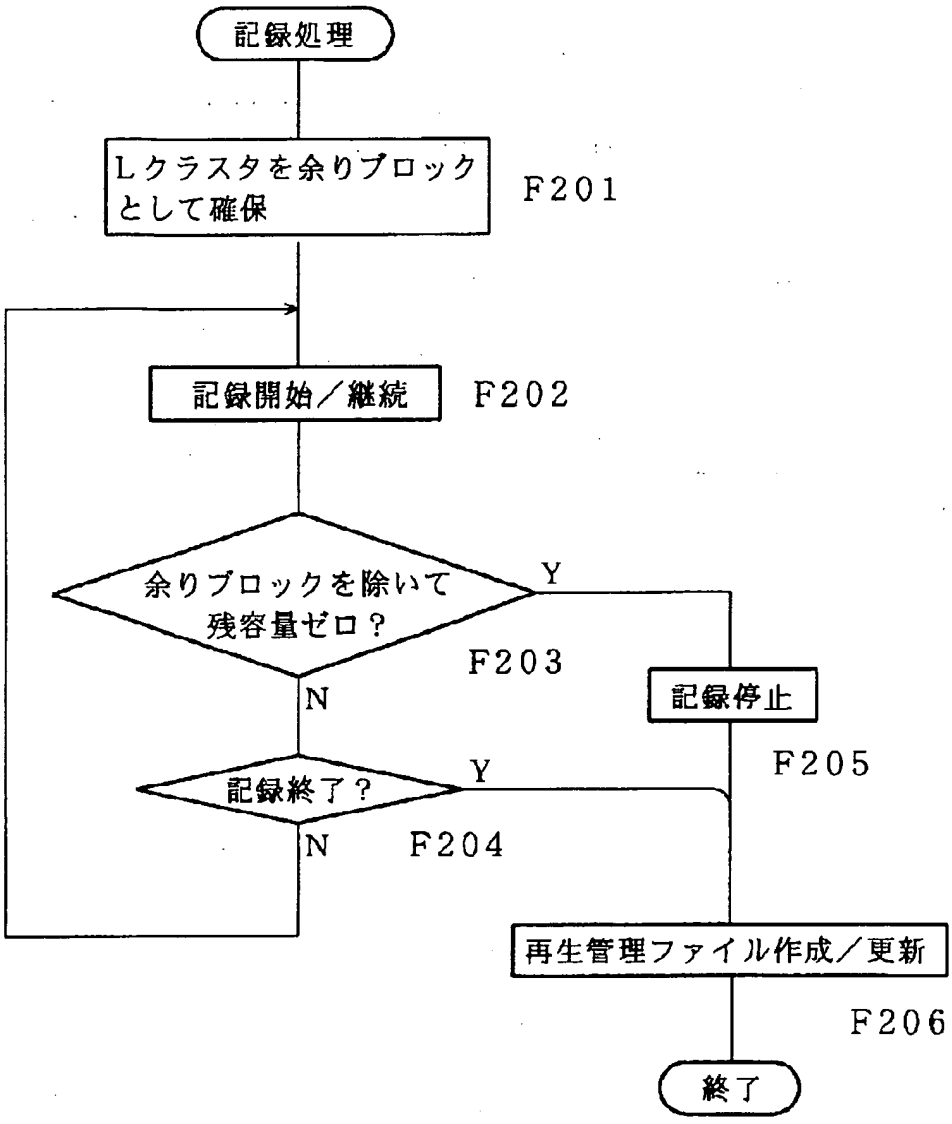
[Drawing 21]


記録処理
記録済ファイル有？
N
Y
F101
平均ファイルサイズM
＝（使用容量）／（ファイル数）
F103
L←２０
F102
予測総ファイル数N
＝（全容量）／M
F104
N≦２０？
N
Y
F105
L←２０－（ファイル数）
L← N －（ファイル数）
F106
F107
Lクラスタを余りブロック
として確保
F108
記録開始／継続
F109
余りブロックを除いて
残容量ゼロ？
Y
F110
記録停止
F117
N
記録終了？
Y
F111
N
N
ファイルチェンジ？
F112
再生管理ファイル作成／更新
F118
Y
L←L－１
F113
終了
N
L＜１？
F114
Y
記録後編集不能の警告表示
F115
L←１
F116

[Drawing 22]


記録処理
使い切り設定？
Y
N
F100
記録済ファイル有？
N
Y
F101
平均ファイルサイズM
＝（使用容量）／（ファイル数）
F103
L←20
F102
予測総ファイル数N
＝（全容量）／M
F104
N≦20？
N
Y
F105
L←20－（ファイル数）
L← N －（ファイル数）
F106
F107
Lクラスタを余りブロック
として確保
F108
記録開始／継続
F109
余りブロックを除いて
残容量ゼロ？
Y
F110
N
記録終了？
Y
F111
N
ファイルチェンジ？
N
Y
F112
L←L－1
F113
L＜1？
N
Y
F114
記録後編集不能の警告表示
F115
L←1
F116
記録開始／継続
F119
残容量1ブロック？
Y
F120
N
記録終了？
Y
N
F121
記録停止
F117
再生管理ファイル作成／更新
F118
終了

[Drawing 23]



[Translation done.]

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-166972
(43)Date of publication of application : 22.06.2001

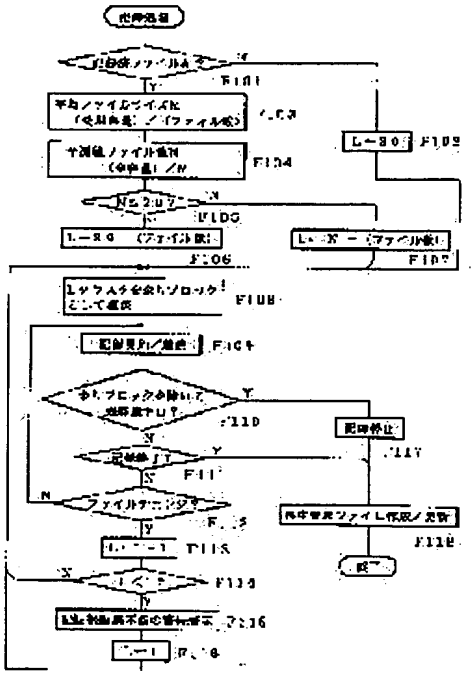
(51)Int.Cl. G06F 12/00
G06F 12/02

(21)Application number : 11-348868
(22)Date of filing : 08.12.1999

(71)Applicant : SONY CORP
(72)Inventor : YOKOTA TEPPEI
KIHARA NOBUYUKI

(54) RECORDING DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To secure a state that recording or editing is made properly executable.
SOLUTION: The required amounts of surplus block are set at the time of a recording operation, and when residual recordable block amounts other than the surplus block amounts reach zero, a program recording operation is ended. After the recording of the program (contents) is ended, the recordable capacity equivalent to at least the surplus block amounts is left.



(19)日本国特許庁（ＪＰ）　(12)**公開特許公報**（Ａ）　(11)特許出願公開番号
特開2001－166972
（P2001－166972A）
(43)公開日　平成13年６月22日(2001.6.22)

(51)Int.Cl.⁷	識別記号	ＦＩ		テーマコード（参考）
Ｇ０６Ｆ　12/00	５０１	Ｇ０６Ｆ　12/00	５０１Ｓ	５Ｂ０６０
			５０１Ｐ	５Ｂ０８２
	５２０		５２０Ｊ	
12/02	５３０	12/02	５３０Ｄ	

審査請求　未請求　請求項の数６　ＯＬ　（全 32 頁）

(21)出願番号　特願平11－348868

(22)出願日　平成11年12月８日(1999.12.8)

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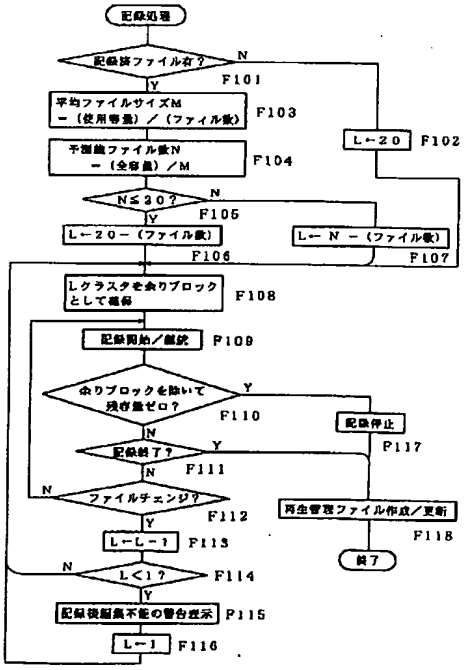
弁理士　脇　篤夫　（外１名）

Ｆターム(参考)　5B060 AA05 AA09 AA12 AC11
5B082 BA11 CA04 CA16 CA17 EA01
EA07 GA15 JA08

(54)【発明の名称】　記録装置

(57)【要約】
【課題】　記録や編集が適切に実行できる状態を確保する。
【解決手段】　記録動作に際して所要量の余りブロック量を設定するとともに、プログラム記録動作により、記録媒体上で、余りブロック量を除いた記録可能なブロック残量がゼロとなったら、プログラム記録動作を終了させるようにし、プログラム（コンテンツ）の記録終了後において、少なくとも余りブロック量に相当する記録可能容量が残されるものとする。



1

【特許請求の範囲】
【請求項１】　ブロック単位で記録が行われる記録媒体に対して、プログラムをブロック化して記録していくプログラム記録手段と、
記録されたプログラムを管理する管理情報を記録媒体に記録し、又は更新する管理情報記録手段と、
所要量の余りブロック量を設定するとともに、前記プログラム記録手段による記録動作により、記録媒体上で、前記余りブロック量を除いた記録可能なブロック残量がゼロとなったら、前記プログラム記録手段による記録動作を終了させる制御手段と、
を備えたことを特徴とする記録装置。
【請求項２】　前記制御手段は、前記管理情報記録手段による管理情報の記録又は更新、及び／又は記録されたプログラムの編集に用いられるブロックとして、前記余りブロック量を設定することを特徴とする請求項１に記載の記録装置。
【請求項３】　前記制御手段は、前記プログラム記録手段による記録動作の際に、記録媒体上に記録されているプログラム数に応じて、前記余りブロック量を設定することを特徴とする請求項１に記載の記録装置。
【請求項４】　前記制御手段は、前記プログラム記録手段による記録動作の際に、記録媒体上に記録されているプログラムの平均データサイズと、記録媒体の容量に応じて、前記余りブロック量を設定することを特徴とする請求項１に記載の記録装置。
【請求項５】　前記制御手段は、記録媒体において記録可能なブロック残量が所定以下となったら、その記録媒体に記録されているプログラムについての編集処理が不可とされることの警告を出力することを特徴とする請求項１に記載の記録装置。
【請求項６】　記録媒体上で前記余りブロック量を除いた記録可能なブロック残量がゼロとなったら前記プログラム記録手段による記録動作を終了させる制御を前記制御手段に実行させる動作モードと、記録媒体上で記録可能なブロック残量がゼロとなるまで前記プログラム記録手段による記録動作を続行可能とする制御を前記制御手段に実行させる動作モードとを選択できるようにしたことを特徴とする請求項１に記載の記録装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、例えばオーディオデータやビデオデータなどのプログラム（コンテンツ）を記録媒体に記録する記録装置に関するものである。
【０００２】
【従来の技術】ＥＥＰＲＯＭ(Electrically Erasable Programmable ROM)と呼ばれる電気的に書き換え可能な不揮発性メモリは、１ビットを２個のトランジスタで構成するために、１ビット当たりの占有面積が大きく、集積度を高くするのに限界があった。この問題を解決するために、全ビット一括消去方式により１ビットを１トランジスタで実現することが可能なフラッシュメモリが開発された。フラッシュメモリは、磁気ディスク、光ディスク等の記録媒体に代わりうるものとして期待されている。

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【０００３】フラッシュメモリを機器に対して着脱自在に構成したメモリカードも知られている。このメモリカードを使用すれば、従来のＣＤ（コンパクトディスク）、ＭＤ（ミニディスク）等のディスク状媒体に換えてメモリカードを使用するディジタルオーディオデータ等の記録／再生装置を実現することができる。
【０００４】そして、フラッシュメモリを用いたメモリカードを記録媒体としてオーディオデータやビデオデータ等のプログラム（コンテンツともいう）を記録再生するシステムでは、例えば従来、パーソナルコンピュータで使用されるファイル管理システムである、ＦＡＴ(File Allocation Table) ファイルシステムを採用することや、ファイル管理情報の工夫により、容易にコンテンツの編集が可能となる。例えば１つの楽曲としてのオーディオデータが１つのコンテンツとして記録されると仮定すると、そのコンテンツを分割して２つのコンテンツ、すなわち２つの曲にするデバイド編集や、逆に２つのコンテンツを結合させて１つのコンテンツ、すなわち１つの曲にするコンバイン編集なども可能である。これにより、ユーザーサイドでは、メモリカードに記録したコンテンツを任意に加工して楽しむといったことも可能となる。
【０００５】
【発明が解決しようとする課題】ところで、従来よりオーディオデータとしてのコンテンツを編集可能なシステムとしてミニディスクシステムが知られている。このミニディスクシステムでは、コンテンツを管理する管理情報である、いわゆるＴＯＣデータを書き換えることで、コンテンツの編集を実現してきた。そしてミニディスク（光磁気ディスク）上では、コンテンツを記録するプログラム領域と、ＴＯＣデータを記録する管理情報領域がそれぞれ別に、所定の容量で設定されており、ＴＯＣデータの情報量がプログラム（コンテンツ）の記録容量に影響を与えることはなかった。また、編集を何度繰り返したとしても、それは全て管理情報領域内でのＴＯＣデータの書換が行われるのみであるため、これもプログラム（コンテンツ）の記録容量に影響を与えることはない。
【０００６】ところが、フラッシュメモリの場合は、同一位置に書込を繰り返すと、著しくメモリ寿命が縮まるという性質があることから、絶えず書き込み位置を移動させることが好適であるとされている。このため、メモリカードにおいてコンテンツを記録する領域と、コンテンツを管理する管理情報を記録する領域とを特定せず、例えば管理情報を更新する場合は、新たな領域に新たな

管理情報を書き込み、旧管理情報を消去するような記録動作を行っている。これは、コンテンツの記録動作や編集動作に伴って管理情報の更新が必要とされる場合は、からなず管理情報を新たに書き込めるだけの領域が確保されていることが必要となることを意味する。換言すれば、所定以上の空き容量がなければ、管理情報の更新ができないものとなり、これにより記録動作が完結せず、また編集ができない状態となる。またブロックといわれる所定単位でデータの管理等を行うメモリカードでは、例えばデバイド編集などの際に新たに１ブロック分が必要となることがある。これも、所定以上の空き容量がなければ、コンテンツの編集ができないということを意味する。

【０００７】つまりフラッシュメモリを用いたメモリカードを記録媒体とする場合は、コンテンツの記録によりメモリカードの残りの記録可能容量が所定未満となってしまうと、記録後に必要な管理情報の更新や、記録されているコンテンツについての編集が実行できなくなるという不都合がある。

【０００８】

【課題を解決するための手段】本発明はこのような問題に鑑みて、プログラム（コンテンツ）の記録に応じた管理情報の更新や、編集処理が適切に実行できるようにすることを目的とする。

【０００９】このために本発明の記録装置は、ブロック単位で記録が行われる記録媒体に対して、プログラムをブロック化して記録していくプログラム記録手段と、記録されたプログラムを管理する管理情報を記録媒体に記録し、又は更新する管理情報記録手段と、所要量の余りブロック量を設定するとともに、プログラム記録手段による記録動作により、記録媒体上で、余りブロック量を除いた記録可能なブロック残量がゼロとなったら、プログラム記録手段による記録動作を終了させる制御手段とを備えるようにする。つまり、管理情報の記録又は更新や、記録されたプログラムの編集に用いられるブロックとして、余りブロック量を設定しておき、プログラムの記録動作は、余りブロック量として設定された容量を残した状態で終了されるようにする。

【００１０】

【発明の実施の形態】以下、本発明の実施の形態について説明していく。この実施の形態では、記録媒体の例としての不揮発性メモリ（フラッシュメモリ）を搭載するメモリカードを挙げ、記録装置の例として、メモリカードに対して記録再生動作を行うことのできるレコーダを挙げる。また、実施の形態において扱うことのできるプログラム（コンテンツ）としてのデータは、オーディオデータ、動画データ、静止画データ等のビデオデータ、テキストデータ、プログラムデータ等、各種のものがあるが、説明上は楽曲等のオーディオデータを扱うものとする。なお、主たるコンテンツとしてオーディオデータを扱う場合でも、ディジタルオーディオ信号以外の画像、文字等を付加情報として記録／再生可能となる。説明は次の順序で行う。

１．レコーダの構成
２．メモリカードの構成
３．ファイルシステム
３－１　処理構造及びデータ構造
３－２　ディレクトリ構成
３－３　管理構造及び編集方式
３－４　再生管理ファイル
３－５　データファイル
４．記録処理
４－１　処理例１
４－２　処理例２
４－３　処理例３

【００１１】１．レコーダの構成

図１により、オーディオデータ等のプログラム（コンテンツ）をメモリカードに対して記録再生することのできるメモリカード記録再生装置（以下、レコーダ１）の構成を説明する。このレコーダ１は、記録媒体として、着脱自在のメモリカードを使用する。そしてこのレコーダ１は、単体のオーディオ装置として構成してもよいし、パーソナルコンピュータ、或いはオーディオ／ビジュアル機器に内蔵された装置部として構成してもよい。単体のオーディオ装置とする場合は、例えばレコーダ１は据置型或いは携帯用小型の記録再生装置とされる。その場合、アンプ装置、スピーカ、ＣＤプレーヤ、ＭＤレコーダ、チューナ等と共にオーディオシステムを構成することもできる。また他の機器に内蔵される形態としては、例えばパーソナルコンピュータにおいてＣＤ－ＲＯＭドライブやフロッピーディスクドライブと同様の位置づけで、メモリカードドライブとして採用することができる。さらにレコーダ１をビデオカメラやゲーム機器に内蔵して、メモリカードをビデオデータやオーディオデータの記録媒体として用いることも可能である。またレコーダ１は、上記の単体型、内蔵型に関わらず、衛星を使用したデータ通信、ディジタル放送、インターネット等を経由して配信されるディジタルオーディオ信号等を記録するレコーダとしても適用できる。

【００１２】図１はこれら各種の態様で実現できるメモリカード記録再生装置としての一般的な構成を示すものである。レコーダ１は、それぞれ１チップＩＣで構成されたオーディオエンコーダ／デコーダＩＣ１０、セキュリティＩＣ２０、ＤＳＰ(Digital Signal Processor)３０を有する。そしてレコーダ１に対して着脱自在のメモリカード４０が記録媒体として用いられる。メモリカード４０は、フラッシュメモリ（不揮発性メモリ）、メモリコントロールブロック、ＤＥＳ(Data Encryption Standard)の暗号化回路を含むセキュリティブロックが１チップ上にＩＣ化されたものである。なお本例では、ＤＳ

Ｐ３０を使用しているが、ＤＳＰに代えてマイクロコンピュータを使用しても良い。

【００１３】オーディオエンコーダ／デコーダＩＣ１０は、オーディオインタフェース１１およびエンコーダ／デコーダブロック１２を有する。エンコーダ／デコーダブロック１２は、ディジタルオーディオ信号をメモリカード４０に書き込むために高能率符号化し、また、メモリカード４０から読み出されたデータを復号する。高能率符号化方法としては、ミニディスクで採用されているＡＴＲＡＣ(AdaptiveTransform Acoustic Coding)を改良したもの（ＡＴＲＡＣ３と表記する）が使用できる。

【００１４】ＡＴＲＡＣ３では、４４．１ｋHzでサンプリングした１サンプル１６ビットのオーディオデータを処理する。ＡＴＲＡＣ３でオーディオデータを処理する時の最小のデータ単位がサウンドユニットＳＵである。１ＳＵは、１０２４サンプル分（１０２４×１６ビット×２チャンネル）を数百バイトに圧縮したものであり、時間にして約２３ｍ秒である。ＡＴＲＡＣ３により約１／１０にオーディオデータが圧縮される。ミニディスクにおいてそうであるように、ＡＴＲＡＣ３の工夫された信号処理によって、圧縮／伸長処理による音質の劣化は少ない。

【００１５】ライン入力セレクタ１３は、ＭＤの再生出力、チューナの出力、テープ再生出力を選択的にＡ／Ｄ変換器１４に供給する。Ａ／Ｄ変換器１４は、選択されたライン入力信号を（サンプリング周波数＝４４．１ｋHz、１サンプル＝１６ビット）のディジタルオーディオ信号へ変換する。ディジタル入力セレクタ１６は、ＭＤ、ＣＤ、ＣＳ（衛星ディジタル放送）のディジタル出力を選択的にディジタル入力レシーバ１７に供給する。ディジタル入力は、例えば光ケーブルを介して伝送される。ディジタル入力レシーバ１７の出力がサンプリングレートコンバータ１５に供給され、ディジタル入力のサンプリング周波数が４４．１ｋHzに変換される。

【００１６】オーディオエンコーダ／デコーダＩＣ１０のエンコーダ／デコーダブロック１２でのエンコード処理により得られた符号化データは、セキュリティＩＣ２０のインタフェース２１を介してＤＥＳの暗号化回路２２に供給される。ＤＥＳの暗号化回路２２は、ＦＩＦＯ２３を有している。ＤＥＳの暗号化回路２２は、コンテンツの著作権を保護するための備えられている。なお後述するが、メモリカード４０にも、ＤＥＳの暗号化回路が組み込まれている。レコーダ１のＤＥＳの暗号化回路２２は、複数のマスターキーと機器毎にユニークなストレージキーを持つ。さらに、ＤＥＳの暗号化回路２２は、乱数発生回路を持ち、ＤＥＳの暗号化回路を内蔵するメモリカード４０と認証およびセッションキーを共有することができる。よりさらに、ＤＥＳの暗号化回路２２は、ＤＥＳの暗号化回路を通してストレージキーでキーをかけなおすことができる。

【００１７】ＤＥＳの暗号化回路２２からの暗号化されたオーディオデータがＤＳＰ(Digital Signal Processor) ３０に供給される。ＤＳＰ３０は、図示しない着脱機構に装着されたメモリカード４０との間で、図２に示すメモリインタフェース３８を介しての通信を行い、暗号化されたデータをフラッシュメモリに書き込む。ＤＳＰ３０とメモリカード４０との間では、シリアル通信がなされる。また、メモリカード４０の制御に必要なメモリ容量を確保するために、ＤＳＰ３０に対して外付けのＳＲＡＭ(Static Random Access Memory) ３１が接続される。

【００１８】さらにＤＳＰ３０に対して、端子３２が接続され、図示しない外部機器又は外部回路部との間でコンテンツデータや制御データの相互通信を行うことができるようにされている。ＤＳＰ３０は図２に示すインターフェース３７を介して、外部機器等との間で通信を行う。例えばこのレコーダ１が単体で構成される場合は、インターフェース３７及び端子３２は、例えばＵＳＢ、ＩＥＥＥ１３９４、ＩＥＣ９５８、シリアルポート通信、パラレルポート通信など、所定の通信方式に応じたものとされ、パーソナルコンピュータやオーディオ／ビジュアル機器等との間で通信可能とされる。

【００１９】また、このレコーダ１がパーソナルコンピュータやオーディオ／ビジュアル機器などに内蔵される場合は、インターフェース３７及び端子３２は、例えばそれらの機器のシステムコントローラと接続される内部バス等の構成をとることになる。

【００２０】端子３２に接続された機器或いは部位からは、各種のデータがＤＳＰ３０に供給される。例えばレコーダ１がオーディオシステムやコンピュータシステムの一部とされている場合は、そのオーディオシステムやコンピュータシステムの全体の動作を制御する外部のシステムコントローラからは、ユーザの操作に応じて発生した録音指令、再生指令等のデータをＤＳＰ３０に与える。また、画像情報、文字情報等の付加情報のデータも端子３２を介してＤＳＰ３０に供給される。さらにＤＳＰ３０は、端子３２を介して、メモリカード４０から読み出された付加情報データ、制御信号等を外部のシステムコントローラに供給することもできる。

【００２１】なお、図１にはユーザーが各種の操作を行う操作キー等が設けられた操作部３９、及びユーザーに対して各種の情報の提示を行う表示部３３を示している。これらは特にレコーダ１が単体で構成される場合に必要となるものであり、例えばレコーダ１がパーソナルコンピュータに内蔵される場合などは、ＤＳＰ３０に操作部３９及び表示部３３が直接接続される必要はない。つまり単体の場合はＤＳＰ３０が操作部３９からの操作入力の処理や表示部３３での表示制御を行うことになるが、内蔵型の場合は、その装置のシステムコントローラがこれらの制御を行い、必要に応じてＤＳＰ３０に操作

情報を供給したり、或いはＤＳＰ３０から表示すべき内容を示す情報を受け取ったりすればよいためである。

【００２２】ＤＳＰ３０によってメモリカード４０から読み出したコンテンツとしての暗号化されたオーディオデータは、セキュリティＩＣ２０によって復号化され、オーディオエンコーダ／デコーダＩＣ１０によってＡＴＲＡＣ３の復号化処理を受ける。そしてオーディオエンコーダ／デコーダ１０の復号化出力がＤ／Ａ変換器１８に供給され、アナログオーディオ信号へ変換される。そして、アナログオーディオ信号がライン出力端子１９に取り出される。

【００２３】ライン出力は、図示しないアンプ装置等に伝送され、スピーカまたはヘッドホンにより再生される。なおＤ／Ａ変換器１８に対してミューティング信号が外部のコントローラから供給される。ミューティング信号がミューティングのオンを示す時には、ライン出力端子１９からのオーディオ出力が禁止される。

【００２４】なお、図１ではライン出力端子１９のみを示しているが、もちろんデジタル出力端子、ヘッドホン端子等が設けられてもよい。また外部機器へのコンテンツデータの出力は、上述のように端子３２を介して行うこともできる。

【００２５】図２は、ＤＳＰ３０の内部構成を示す。ＤＳＰ３０は、コア３４と、フラッシュメモリ３５と、ＳＲＡＭ３６と、インタフェース３７と、メモリカードインタフェース３８と、バスおよびバス間のブリッジとで構成される。このＤＳＰ３０はマイクロコンピュータと同様に機能し、コア３４がＣＰＵに相当する。フラッシュメモリ３５にはＤＳＰ３０の処理のためのプログラムが格納されている。またＳＲＡＭ３６と外部のＳＲＡＭ３１とが、各種処理のためのワークメモリとして使用される。

【００２６】ＤＳＰ３０は、インタフェース３７を介して受け取った録音指令等の操作信号（又は図１に示す操作部３９から入力された操作信号）に応答して、所定の暗号化されたオーディオデータ、所定の付加情報データをメモリカード４０に対して書き込み、また、これらのデータをメモリカード４０から読み出す処理を制御する。すなわち、オーディオデータ、付加情報の記録／再生を行うためのオーディオシステム全体のアプリケーションソフトウェアと、メモリカード４０との間にＤＳＰ３０が位置し、メモリカード４０のアクセス、ファイルシステム等のソフトウェアによってＤＳＰ３０が動作する。

【００２７】ＤＳＰ３０におけるメモリカード４０上のファイル管理は、既存のパーソナルコンピュータで使用されているＦＡＴファイルシステムが使用される。このファイルシステムに加えて、本例では、後述するようなデータ構成の再生管理ファイルが使用される。再生管理ファイルは、メモリカード４０上に記録されているデータファイルを管理する。すなわち第１のファイル管理情報としての再生管理ファイルは、オーディオデータのファイルを管理するものであり、第２のファイル管理情報としてのＦＡＴは、オーディオデータのファイルと再生管理ファイルを含むメモリカード０のフラッシュメモリ上のファイル全体を管理する。再生管理ファイルは、メモリカード４０に記録される。また、ＦＡＴは、ルートディレクトリ等と共に、予め出荷時にフラッシュメモリ上に書き込まれている。

【００２８】なお本例では、著作権を保護するために、ＡＴＲＡＣ３により圧縮されたオーディオデータを暗号化している。一方、管理ファイルは、著作権保護が必要ないとして、暗号化を行わないようにしている。また、メモリカード４０としても、暗号化機能を持つものと、持たないものとがありうる。本例のように、著作物であるオーディオデータを記録するレコーダ１が使用できるものは、暗号化機能を持つメモリカードのみである。

【００２９】２．メモリカードの構成

図３は、メモリカード４０の構成を示す。メモリカード４０は、コントロールブロック４１とフラッシュメモリ４２が１チップＩＣとして構成されたものである。レコーダ１のＤＳＰ３０とメモリカード４０との間の双方向シリアルインタフェースは、１０本の線からなる。主要な４本の線は、データ伝送時にクロックを伝送するためのクロック線ＳＣＫと、ステータスを伝送するためのステータス線ＳＢＳと、データを伝送するデータ線ＤＩＯ、インターラプト線ＩＮＴとである。その他に電源供給用線として、２本のＧＮＤ線および２本のＶＣＣ線が設けられる。２本の線Ｒｅｓｅｒｖは、未定義の線である。

【００３０】クロック線ＳＣＫは、データに同期したクロックを伝送するための線である。ステータス線ＳＢＳは、メモリカード４０のステータスを表す信号を伝送するための線である。データ線ＤＩＯは、コマンドおよび暗号化されたオーディオデータを入出力するための線である。インターラプト線ＩＮＴは、メモリカード４０からレコーダ１のＤＳＰ３０に対しての割り込みを要求するインターラプト信号を伝送する線である。メモリカード４０を装着した時にインターラプト信号が発生する。但し、本例では、インターラプト信号をデータ線ＤＩＯを介して伝送するようにしているので、インターラプト線ＩＮＴを接地している。

【００３１】コントロールブロック４１のシリアル／パラレル変換・パラレル／シリアル変換・インタフェースブロック（Ｓ／Ｐ，Ｐ／Ｓ，ＩＦブロックと略す）４３は、上述した複数の線を介して接続されたレコーダのＤＳＰ３０とコントロールブロック４１とのインタフェースである。Ｓ／Ｐ，Ｐ／Ｓ，ＩＦブロック４３は、レコーダ１のＤＳＰ３０から受け取ったシリアルデータをパラレルデータに変換し、コントロールブロック４１に取

り込み、コントロールブロック４１からのパラレルデータをシリアルデータに変換してレコーダ１のＤＳＰ３０に送る。また、Ｓ／Ｐ，Ｐ／Ｓ，ＩＦブロック４３は、データ線ＤＩＯを介して伝送されるコマンドおよびデータを受け取った時に、フラッシュメモリ４２に対する通常のアクセスのためのコマンドおよびデータと、暗号化に必要なコマンドおよびデータとを分離する。

【００３２】つまり、データ線ＤＩＯを介して伝送されるフォーマットでは、最初にコマンドが伝送され、その後にデータが伝送される。Ｓ／Ｐ，Ｐ／Ｓ，ＩＦブロック４３は、コマンドのコードを見て、通常のアクセスに必要なコマンドおよびデータか、暗号化に必要なコマンドおよびデータかを判別する。この判別結果に従って、通常のアクセスに必要なコマンドをコマンドレジスタ４４に格納し、データをページバッファ４５およびライトレジスタ４６に格納する。ライトレジスタ４６と関連してエラー訂正符号化回路４７が設けられている。ページバッファ４５に一時的に蓄えられたデータに対して、エラー訂正符号化回路４７がエラー訂正符号の冗長コードを生成する。

【００３３】コマンドレジスタ４４、ページバッファ４５、ライトレジスタ４６およびエラー訂正符号化回路４７の出力データがフラッシュメモリインタフェースおよびシーケンサ（メモリＩ／Ｆ，シーケンサと略す）５１に供給される。メモリＩＦ，シーケンサ５１は、コントロールブロック４１とフラッシュメモリ４２とのインタフェースであり、両者の間のデータのやり取りを制御する。メモリＩＦ，シーケンサ５１を介してデータがフラッシュメモリ４２に書き込まれる。

【００３４】フラッシュメモリ４２に書き込まれるコンテンツ（ＡＴＲＡＣ３により圧縮されたオーディオデータ、以下ＡＴＲＡＣ３データと表記する）は、著作権保護のために、レコーダ１のセキュリティＩＣ２０とメモリカード４０のセキュリティブロック５２とによって、暗号化されたものである。セキュリティブロック５２は、バッファメモリ５３と、ＤＥＳの暗号化回路５４と、不揮発性メモリ５５とを有する。

【００３５】メモリカード４０のセキュリティブロック５２は、複数の認証キーとメモリカード毎にユニークなストレージキーを持つ。不揮発性メモリ５５は、暗号化に必要なキーを格納するもので、外部からは見えない。例えばストレージキーが不揮発性メモリ５５に格納される。さらに、乱数発生回路を持ち、専用（ある決められたデータフォーマット等の使用が同じシステム内の意味）レコーダ１と認証ができ、セッションキーを共有できる。よりさらに、ＤＥＳの暗号化回路５４を通してストレージキーでキーのかけ直しができる。

【００３６】例えばメモリカード４０をレコーダ１に装着した時に認証がなされる。認証は、レコーダ１のセキュリティＩＣ２０とメモリカード４０のセキュリティブロック５２によってなされる。レコーダ１は、装着されたメモリカード４０が本人（同じシステム内のメモリカード）であることを認め、また、メモリカード４０が相手のレコーダが本人（同じシステム内のレコーダ）であることを認めると、互いに相手が本人であることを確認する。認証が行われると、レコーダ１とメモリカード４０がそれぞれセッションキーを生成し、セッションキーを共有する。セッションキーは、認証の度に生成される。

【００３７】そして、メモリカード４０に対するコンテンツの書き込み時には、レコーダ１がセッションキーでコンテンツキーを暗号化してメモリカード４０に渡す。メモリカード４０では、コンテンツキーをセッションキーで復号し、ストレージキーで暗号化してレコーダ１に渡す。ストレージキーは、メモリカード４０の一つ一つにユニークなキーであり、レコーダ１は、暗号化されたコンテンツキーを受け取ると、フォーマット処理を行い、暗号化されたコンテンツキーと暗号化されたコンテンツをメモリカード４０に書き込む。

【００３８】フラッシュメモリ４２からのデータ読出時には、読み出されたデータがメモリＩＦ，シーケンサ５１を介してページバッファ４５、リードレジスタ４８、エラー訂正回路４９に供給される。そしてページバッファ４５に記憶されたデータがエラー訂正回路４９によってエラー訂正がなされる。エラー訂正されたページバッファ４５の出力およびリードレジスタ４８の出力はＳ／Ｐ，Ｐ／Ｓ，ＩＦブロック４３に供給され、上述したシリアルインタフェースを介してレコーダ１のＤＳＰ３０に供給される。

【００３９】このような読出時には、ストレージキーで暗号化されたコンテンツキーとブロックキーで暗号化されたコンテンツとがフラッシュメモリ４２から読み出される。そしてセキュリティブロック５２によって、ストレージキーでコンテンツキーが復号される。さらに復号されたコンテンツキーがセッションキーで暗号化されてレコーダ１側に送信される。レコーダ１は、受信したセッションキーでコンテンツキーを復号する。レコーダ１は、復号したコンテンツキーでブロックキーを生成する。このブロックキーによって、暗号化されたＡＴＲＡＣ３データを順次復号する。

【００４０】なお、コンフィグレーションＲＯＭ５０には、メモリカード４０のバージョン情報、各種の属性情報等が格納されている。また、メモリカード４０には、ユーザが必要に応じて操作可能な誤消去防止用のスイッチ６０が備えられている。このスイッチ６０が消去禁止の接続状態にある場合には、フラッシュメモリ４２を消去することを指示するコマンドがレコーダ側から送られてきても、フラッシュメモリ４２の消去が禁止される。さらに、発振器６１は、メモリカード４０の処理のタイミング基準となるクロックを発生する。

【００４１】３．ファイルシステム
３－１　処理構造及びデータ構造
図４は、メモリカード４０を記憶媒体とするシステムのファイルシステム処理階層を示す。ファイルシステム処理階層としては、アプリケーション処理層が最上位であり、その下に、ファイル管理処理層、論理アドレス管理層、物理アドレス管理層、フラッシュメモリアクセスが順次おかれる。この階層構造において、ファイル管理処理層がＦＡＴファイルシステムである。物理アドレスは、フラッシュメモリの各ブロックに対して付されたもので、ブロックと物理アドレスの対応関係は、不変である。論理アドレスは、ファイル管理処理層が論理的に扱うアドレスである。
【００４２】図５は、メモリカード４０におけるフラッシュメモリ４２のデータの物理的構成の一例を示す。フラッシュメモリ４２は、セグメントと称されるデータ単位が所定数のブロック（固定長）へ分割され、１ブロックが所定数のページ（固定長）へ分割される。フラッシュメモリ４２では、ブロック単位で消去が一括して行われ、書き込みと読み出しは、ページ単位で一括して行われる。
【００４３】各ブロックおよび各ページは、それぞれ同一のサイズとされ、１ブロックがページ０からページｍで構成される。１ブロックは、例えば８ＫＢ（Ｋバイト）バイトまたは１６ＫＢの容量とされ、１ページが５１２Ｂの容量とされる。フラッシュメモリ４２全体では、１ブロック＝８ＫＢの場合で、４ＭＢ（５１２ブロック）、８ＭＢ（１０２４ブロック）とされ、１ブロック＝１６ＫＢの場合で、１６ＭＢ（１０２４ブロック）、３２ＭＢ（２０４８ブロック）、６４ＭＢ（４０９６ブロック）の容量とされる。
【００４４】１ページは、５１２バイトのデータ部と１６バイトの冗長部とからなる。冗長部の先頭の３バイトは、データの更新に応じて書き換えられるオーバーライト部分とされる。３バイトの各バイトに、先頭から順にブロックステータス、ページステータス、更新ステータスが記録される。冗長部の残りの１３バイトの内容は、原則的にデータ部の内容に応じて固定とされる。この１３バイトは、管理フラグ（１バイト）、論理アドレス（２バイト）、フォーマットリザーブの領域（５バイト）、分散情報ＥＣＣ（２バイト）およびデータＥＣＣ（３バイト）からなる。分散情報ＥＣＣは、管理フラグ、論理アドレス、フォーマットリザーブに対する誤り訂正用の冗長データであり、データＥＣＣは、５１２バイトのデータに対する誤り訂正用の冗長データである。
【００４５】管理フラグとして、システムフラグ（その値が１：ユーザブロック、０：ブートブロック）、変換テーブルフラグ（１：無効、０：テーブルブロック）、コピー禁止指定（１：ＯＫ、０：ＮＧ）、アクセス許可（１：ｆｒｅｅ、０：リードプロテクト）の各フラグが記録される。
【００４６】セグメントにおける先頭の二つのブロック、すなわちブロック０およびブロック１がブートブロックである。ブロック１は、ブロック０と同一のデータが書かれるバックアップ用である。ブートブロックは、メモリカード４０内の有効なブロックの先頭ブロックであり、メモリカード４０を機器に装填した時に最初にアクセスされるブロックである。残りのブロックがユーザブロックである。ブートブロックの先頭のページ０にヘッダ、システムエントリ、ブート＆アトリビュート情報が格納される。ページ１に使用禁止ブロックデータが格納される。ページ２にＣＩＳ(Card Information Structure)／ＩＤＩ(Identify Drive Information)が格納される。
【００４７】ブートブロックのヘッダは、ブートブロックＩＤ、ブートブロック内の有効なエントリ数が記録される。システムエントリには、使用禁止ブロックデータの開始位置、そのデータサイズ、データ種別、ＣＩＳ／ＩＤＩのデータ開始位置、そのデータサイズ、データ種別が記録される。ブート＆アトリビュート情報には、メモリカード４０のタイプ（読み出し専用、リードおよびライト可能、両タイプのハイブリッド等）、ブロックサイズ、ブロック数、総ブロック数、セキュリティ対応か否か、カードの製造に関連したデータ（製造年月日等）等が記録される。
【００４８】いわゆるフラッシュメモリは、データの書き換えを行うことにより絶縁膜の劣化を生じ、書き換え回数が制限される。従って、ある同一の記憶領域（ブロック）に対して繰り返し集中的にアクセスがなされることを防止する必要がある。従って、ある物理アドレスに格納されているある論理アドレスのデータを書き換える場合、フラッシュメモリのファイルシステムでは、同一のブロックに対して更新したデータを再度書き込むことはせずに、未使用のブロックに対して更新したデータを書き込むようになされる。その結果、データ更新前における論理アドレスと物理アドレスの対応関係が更新後では、変化する。このような処理（スワップ処理と称する）を行うことで、同一のブロックに対して繰り返して集中的にアクセスがされることが防止され、フラッシュメモリの寿命を延ばすことが可能となる。
【００４９】論理アドレスは、一旦ブロックに対して書き込まれたデータに付随するので、更新前のデータと更新後のデータの書き込まれるブロックが移動しても、ＦＡＴからは、同一のアドレスが見えることになり、以降のアクセスを適正に行うことができる。スワップ処理により論理アドレスと物理アドレスとの対応関係が変化するので、両者の対応を示す論理－物理アドレス変換テーブルが必要となる。このテーブルを参照することによって、ＦＡＴが指定した論理アドレスに対応する物理アドレスが特定され、特定された物理アドレスが示すブロッ

クに対するアクセスが可能となる。

【００５０】論理－物理アドレス変換テーブルは、ＤＳＰ３０によってＳＲＡＭ３１、３６上に格納される。若し、ＲＡＭ容量が少ない時は、フラッシュメモリ４２中に格納することができる。このテーブルは、概略的には、昇順に並べた論理アドレス（２バイト）に物理アドレス（２バイト）をそれぞれ対応させたテーブルである。フラッシュメモリ４２の最大容量を１２８ＭＢ（８１９２ブロック）としているので、２バイトによって８１９２のアドレスを表すことができる。また、論理－物理アドレス変換テーブルは、セグメント毎に管理され、そのサイズは、フラッシュメモリ４２の容量に応じて大きくなる。例えばフラッシュメモリ４２の容量が８ＭＢ（２セグメント）の場合では、２個のセグメントのそれぞれに対して２ページが論理－物理アドレス変換テーブル用に使用される。論理－物理アドレス変換テーブルを、フラッシュメモリ４２中に格納する時には、上述した各ページの冗長部における管理フラグの所定の１ビットによって、当該ブロックが論理－物理アドレス変換テーブルが格納されているブロックか否かが指示される。

【００５１】上述したメモリカード４０は、ディスク状記録媒体と同様にパーソナルコンピュータのＦＡＴファイルシステムによって使用可能なものである。図５には示されてないが、フラッシュメモリ４２上にＩＰＬ領域、ＦＡＴ領域およびルート・ディレクトリ領域が設けられる。ＩＰＬ領域には、最初にレコーダ１のメモリにロードすべきプログラムが書かれているアドレス、並びにメモリの各種情報が書かれている。ＦＡＴ領域には、ブロック（クラスタ）の関連事項が書かれている。ＦＡＴには、未使用のブロック、次のブロック番号、不良ブロック、最後のブロックをそれぞれ示す値が規定される。さらに、ルートディレクトリ領域には、ディレクトリエントリ（ファイル属性、更新年月日、開始クラスタ、ファイルサイズ等）が書かれている。

【００５２】本例では、上述したメモリカード４０のフォーマットで規定されるファイル管理システムとは別個に、音楽用ファイルに対して、各トラックおよび各トラックを構成するパーツを管理するための再生管理ファイルを持つようにしている。この再生管理ファイルは、メモリカード４０のユーザブロックを利用してフラッシュメモリ４２上に記録される。それによって、メモリカード４０上のＦＡＴが壊れても、ファイルの修復が可能となる。

【００５３】この再生管理ファイルは、ＤＳＰ３０により作成される。例えば最初に電源をオンした時に、メモリカード４０が装着されているか否かが判定され、メモリカード４０が装着されている時には、認証が行われる。認証により正規のメモリカードであることが確認されると、フラッシュメモリ４２のブートブロックがＤＳＰ３０に読み込まれる。そして、論理－物理アドレス変換テーブルが読み込まれる。読み込まれたデータは、ＳＲＡＭ３１、３６に格納される。ユーザが購入して初めて使用するメモリカード４０でも、出荷時にフラッシュメモリ４２には、ＦＡＴや、ルートディレクトリの書き込みがなされている。再生管理ファイルは、録音がなされると、作成される。

【００５４】すなわち、ユーザの操作等によって発生した録音指令がＤＳＰ３０に与えられると、受信したオーディオデータがエンコーダ／デコーダＩＣ１０によって圧縮され、エンコーダ／デコーダＩＣ１０からのＡＴＲＡＣ３データがセキュリティＩＣ２０により暗号化される。そしてＤＳＰ３０が暗号化されたＡＴＲＡＣ３データをメモリカード４０のフラッシュメモリ４２に記録するが、この記録後にＦＡＴおよび再生管理ファイルが更新される。ファイルの更新の度、具体的には、オーディオデータの記録を開始し、記録を終了する度に、ＳＲＡＭ３１および３６上でＦＡＴおよび再生管理ファイルが書き換えられる。そして、メモリカード４０を外す時に、またはパワーをオフする時に、ＳＲＡＭ３１、３６からメモリカード４０のフラッシュメモリ４２上に最終的なＦＡＴおよび再生管理ファイルが格納される。この場合、オーディオデータの記録を開始し、記録を終了する度に、フラッシュメモリ４２上のＦＡＴおよび再生管理ファイルを書き換えても良い。編集を行った場合も、再生管理ファイルの内容が更新される。

【００５５】さらに、本例のデータ構成では、付加情報も再生管理ファイル内に作成、更新され、フラッシュメモリ４２上に記録される。なお、再生管理ファイルとは別に付加情報管理ファイルが作成されるようにしてもよい。付加情報は、外部のコントローラからバスおよびバスインターフェース３２を介してＤＳＰ３０に与えられる。ＤＳＰ３０が受信した付加情報をメモリカード４０のフラッシュメモリ４２上に記録する。付加情報は、セキュリティＩＣ２０を通らないので、暗号化されない。付加情報は、メモリカード４０を取り外したり、電源オフの時に、ＤＳＰ３０のＳＲＡＭからフラッシュメモリ４２に書き込まれる。

【００５６】３－２　ディレクトリ構成

図６は、メモリカード４０のディレクトリ構成を示す。図示するようにルートディレクトリから、静止画用ディレクトリ、動画用ディレクトリ、音声用ディレクトリ、制御用ディレクトリ、音楽用（ＨＩＦＩ）ディレクトリが形成される。本例では、音楽の記録／再生を中心に説明を行うので、以下、音楽用ディレクトリについて説明する。音楽用ディレクトリには、２種類のファイルが置かれる。その１つは、再生管理ファイルＰＢＬＩＳＴ．ＭＳＦ（以下、単にＰＢＬＩＳＴと表記する）であり、他のものは、暗号化された音楽データを収納したＡＴＲＡＣ３データファイルＡ３Ｄｎｎｎｎ．ＭＳＡ（以下、単にＡ３Ｄｎｎｎと表記する）とからなる。ＡＴＲＡＣ

３データファイルは、最大数が４００までと規定されている。ＡＴＲＡＣ３データファイルは、再生管理ファイルに登録した上で機器により任意に作成される。

【００５７】３－３　管理構造及び編集方式

図７は、再生管理ファイルの構成を示し、図８が一つ（１曲）のＡＴＲＡＣ３データファイルの構成を示す。再生管理ファイルは、１６ＫＢ固定長のファイルである。図７に示すように再生管理ファイルは、ヘッダ、１バイトコードのメモリカードの名前ＮＭ１－Ｓ、２バイトコードのメモリカードの名前ＮＭ２－Ｓ、曲順の再生テーブルＴＲＫＴＢＬ、及びメモリカード全体の付加情報ＩＮＦ－Ｓとからなる。

【００５８】また図８に示すＡＴＲＡＣ３データファイル（以下、単にデータファイルともいう）は、本発明でいうプログラム（又はコンテンツ）に相当するものであり、即ち曲単位のファイルである。そしてデータファイルは、先頭の属性ヘッダと、それに続く実際の暗号化された音楽データとからなる。属性ヘッダは１６ＫＢ固定長とされ、再生管理ファイルと類似した構成を有する。データファイルの先頭の属性ヘッダは、ヘッダ、１バイトコードの曲名ＮＭ１、２バイトコードの曲名ＮＭ２、トラックのキー情報等のトラック情報ＴＲＫＩＮＦ、パーツ情報ＰＲＴＩＮＦと、トラックの付加情報ＩＮＦとからなる。ヘッダには、総パーツ数、名前の属性、付加情報のサイズの情報等が含まれる。

【００５９】このデータファイルにおいては、属性ヘッダに対してＡＴＲＡＣ３の音楽データが続く。音楽データは、１６ＫＢのブロック毎に区切られ、各ブロックの先頭にヘッダが付加されている。ヘッダには、暗号を復号するための初期値が含まれる。なお、暗号化の処理を受けるのは、ＡＴＲＡＣ３データファイル中の音楽データのみであって、それ以外の再生管理ファイル、ヘッダ等のデータは、暗号化されない。

【００６０】図９を参照して、曲（コンテンツ）とＡＴＲＡＣ３データファイルの関係について説明する。１つのコンテンツは、１曲として管理されるデータ群を意味する。１曲は、１つのＡＴＲＡＣ３データファイル（図８参照）で構成される。ＡＴＲＡＣ３データファイルは、ＡＴＲＡＣ３により圧縮されたオーディオデータが記録されている。

【００６１】なお、メモリカード４０に対しては、クラスタと呼ばれる単位でデータの記録が行われる。１クラスタは例えば１６ＫＢの容量である。この１クラスタには複数のファイルが混じることがない。またフラッシュメモリ４２を消去する時の最小単位が１ブロックである。音楽データを記録するのに使用するメモリカード４０の場合、ブロックとクラスタは、同意語であり、且つ１クラスタ＝１セクタと定義されている。

【００６２】１曲は、基本的に１パーツで構成されるが、編集が行われると、複数のパーツから１曲が構成されることがある。パーツとは、録音開始からその停止までの連続した時間内で記録されたデータの単位を意味し、通常は、１つのコンテンツは１パーツで構成される。１つのコンテンツが複数のパーツで構成される場合、曲内のパーツのつながりは、各曲の属性ヘッダ内のパーツ情報ＰＲＴＩＮＦ（後述）で管理する。すなわち、パーツサイズは、ＰＲＴＩＮＦの中のパーツサイズＰＲＴＳＩＺＥという４バイトのデータで表す。パーツサイズＰＲＴＳＩＺＥの先頭の２バイトがパーツが持つクラスタの総数を示し、続く各１バイトが先頭および末尾のクラスタ内の開始サウンドユニット（ＳＵと略記する）の位置、終了ＳＵの位置を示す。このようなパーツの記述方法を持つことによって、音楽データを編集する際に通常、必要とされる大量の音楽データの移動をなくすことが可能となる。なおブロック単位の編集に限定すれば、同様に音楽データの移動を回避できるが、ブロック単位は、ＳＵ単位に比して編集単位が大きすぎる。

【００６３】ＳＵは、パーツの最小単位であり、且つＡＴＲＡＣ３でオーディオデータを圧縮する時の最小のデータ単位である。４４．１ｋHzのサンプリング周波数で得られた１０２４サンプル分（１０２４×１６ビット×２チャンネル）のオーディオデータを約１／１０に圧縮した数百バイトのデータがＳＵである。１ＳＵは、時間に換算して約２３ｍ秒になる。通常は、数千に及ぶＳＵによって１つのパーツが構成される。１クラスタが４２個のＳＵで構成される場合、１クラスタで約１秒の音を表すことができる。１つのコンテンツを構成するパーツの数は、付加情報サイズに影響される。パーツ数は、１ブロックの中からヘッダや曲名、付加情報データ等を除いた数で決まるために、付加情報が全く無い状態が最大数（６４５個）のパーツを使用できる条件となる。

【００６４】図９は、ＣＤ等からのオーディオデータを２曲連続して記録した場合のファイル構成を示す。図９（ａ）に１曲目（データファイル＃１）が例えば５つのクラスタ（ＣＬ０～ＣＬ４）で構成された場合を、また図９（ｃ）に２曲目（データファイル＃２）が例えば６つのクラスタ（ＣＬ５～ＣＬ１０）で構成された場合を示している。１曲目と２曲目の曲間では、１クラスタに二つのファイルが混在することが許されないので、次のクラスタ（ＣＬ５）の最初からデータファイル＃２が作成される。従って、データファイル＃１の終端（１曲目の終端）がクラスタの途中に位置しても、図９（ｂ）に拡大して示すように、そのクラスタの残りの部分には、データ（ＳＵ）が存在しないものとされる。第２曲目（データファイル＃２）も同様である。そしてこの例の場合は、データファイル＃１、＃２ともに１パーツで構成される。

【００６５】メモリカード４０に記録されたデータファイルに対しては、編集として、デバイド、コンバイン、イレーズ、ムーブの４種類の処理が規定される。デバイ

ドは、１つのトラックを２つに分割することである。デバイドがされると、総トラック数が１つ増加する。デバイドは、一つのファイルをファイルシステム上で分割して２つのファイルとし、再生管理ファイルを更新する。コンバインは、２つのトラックを１つに結合することである。コンバインされると、総トラック数が１つ減少する。コンバインは、２つのファイルをファイルシステム上で統合して１つのファイルにし、再生管理ファイルを更新する。イレーズは、トラックを消去することである。消された以降のトラック番号が１つ減少する。編集処理としてのムーブは、トラック順番を変えることである。この場合も再生管理ファイルを更新する。なお、ここでいう編集処理としての「ムーブ」は、データの移動を伴うものではなく。例えばＨＤＤ等の記録媒体からメモリカード等の記録媒体へのデータの「ムーブ」とは意味が異なる。記録媒体から記録媒体へのムーブとは、データをコピーした上でコピー元の記録媒体からそのデータを消去することで実現するものである。

【００６６】図９に示す二つの曲（データファイル＃１、＃２）をコンバインした結果を図１０に示す。コンバインされたことでデータファイル＃１、＃２は、１つのデータファイル＃１となり、このデータファイル＃１は、二つのパーツから形成されるものとなる。上述したように本例ではパーツに関する記述方法があるので、コンバインした結果（図１０）において、パーツ１の開始位置、パーツ１の終了位置、パーツ２の開始位置、パーツ２の終了位置をそれぞれＳＵ単位で規定できる。その結果、コンバインした結果のつなぎ目の隙間をつめるために、パーツ２の音楽データを移動する必要がない。

【００６７】また、図１１は、図９（ａ）の一つの曲（データファイル＃１）をクラスタ２の途中でデバイドした結果を示す。デバイドによって、クラスタＣＬ０、ＣＬ１およびクラスタＣＬ２の前側からなるデータファイル＃１と、クラスタＣＬ２（ＣＬ１１）の後側とクラスタＣＬ３、ＣＬ４とからなるデータファイル＃２とが発生する。上述したように、１つのクラスタに二つのファイルが混在することは許されないので、このようにクラスタＣＬ２内の或る位置を分割点とするデバイド編集の場合は、まず、クラスタＣＬ２のデータが、あいている別のクラスタＣＬ１１にコピーされる。そしてデータファイル＃２においては、クラスタＣＬ１１における分割点に相当する位置がスタートポイントとされ、そのクラスタＣＬ１１に、クラスタＣＬ３、ＣＬ４が続くようにされるものとなる。従って、デバイド編集の場合は、再生管理ファイルの更新だけでなく、１つのクラスタを新たに使用することが必要となる。

【００６８】なお、上述のようにパーツに関する記述方法があるので、デバイドした結果（図１１）において、データファイル＃２の先頭（クラスタＣＬ１１）の空きを詰めるように、データを移動する必要がない。

【００６９】３－４　再生管理ファイル

図１２は、再生管理ファイルＰＢＬＩＳＴのより詳細なデータ構成を示す。再生管理ファイルＰＢＬＩＳＴは、１クラスタ（１ブロック＝１６ＫＢ）のサイズである。先頭の３２バイトがヘッダとされる。またヘッダ以外の部分がメモリカード全体に対する名前ＮＭ１－Ｓ（２５６バイト）、名前ＮＭ２－Ｓ（５１２バイト）、ＣＯＮＴＥＮＴＳ　ＫＥＹ、ＭＡＣ、Ｓ－ＹＭＤｈｍｓと、再生順番を管理するテーブルＴＲＫＴＢＬ（８００バイト）と、メモリカード全体に対する付加情報ＩＮＦ－Ｓ（１４７２０バイト）であり、最後にヘッダ中の情報の一部が再度記録される。これらの異なる種類のデータ群のそれぞれの先頭は、再生管理ファイル内で所定の位置となるように規定されている。

【００７０】再生管理ファイルにおいては、（０ｘ０００）および（０ｘ００１０）で表される先頭から３２バイトがヘッダである。なお、ファイル中で先頭から１６バイト単位で区切られた単位をスロットと称する。再生管理ファイルの第１および第２のスロットに配されるヘッダには、下記の意味、機能、値を持つデータが先頭から順に配される。なお、Ｒｅｓｅｒｖｅｄと表記されているデータは、未定義のデータを表している。通常ヌル（０ｘ００）が書かれるが、何が書かれていてもＲｅｓｅｒｖｅｄのデータは無視される。将来のバージョンでは、変更がありうる。また、この部分への書き込みは禁止する。Ｏｐｔｉｏｎと書かれた部分も使用しない場合は、全てＲｅｓｅｒｖｅｄと同じ扱いとされる。

【００７１】ＢＬＫＩＤ－ＴＬ０（４バイト）

意味：BLOCKID FILE ID

機能：再生管理ファイルの先頭であることを識別するための値。

値：固定値＝”ＴＬ＝０”（例えば０ｘ５４４Ｃ２Ｄ３０）

ＭＣｏｄｅ（２バイト）

意味：MAKER CODE

機能：記録した機器の、メーカー、モデルを識別するコード。

値：上位１０ビット（メーカーコード）　下位６ビット（機種コード）

ＲＥＶＩＳＩＯＮ（４バイト）

意味：再生管理ファイル（ＰＢＬＩＳＴ）の書き換え回数。

機能：再生管理ファイルを書き換える度にインクリメントする。

値：０より始まり＋１づつ増加する。

【００７２】ＳＮＩＣ＋Ｌ（２バイト）

意味：ＮＭ１－Ｓ領域に書かれるメモリカードの名前（１バイト）の属性を表す。

機能：使用する文字コードと言語コードを各１バイトで表す。

値：文字コード（Ｃ）は上位１バイトで下記のように文字を区別する。
00: 文字コードは設定しない。単なる２進数として扱う。
01: ASCII 02:ASCII+KANA 03:modifided8859-1
81:MS-JIS 82:KS C 5601-1989 83:GB2312-80 90:S-JIS(for Voice)。
言語コード（Ｌ）は下位１バイトで下記のようにEBU Tech 3258 規定に準じて言語を区別する。
00: 設定しない 08:German 09:English 0A:Spanish 0F:French 15:Italian 1D:Dutch 65:Korean 69:Japanese 75:Chinese
データが無い場合オールゼロとする。
【００７３】ＳＮ２Ｃ＋Ｌ（２バイト）
意味：ＮＭ２－Ｓ領域に書かれるメモリカードの名前（２バイト）の属性を表す。
機能：使用する文字コードと言語コードを各１バイトで表す。
値：上述したＳＮ１Ｃ＋Ｌと同一。
ＳＩＮＦＳＩＺＥ（２バイト）
意味：ＩＮＦ－Ｓ領域に書かれるメモリカード全体に関する付加情報の全てを合計したサイズを表す。
機能：データサイズを１６バイト単位の大きさで記述、無い場合は必ずオールゼロとする。
値：サイズは０ｘ０００１から０ｘ３９Ｃ（９２４）。
【００７４】Ｔ－ＴＲＫ（２バイト）
意味：TOTAL TRACK NUMBER
機能：総トラック数。
値：１から０ｘ０１９０（最大４００トラック）、データが無い場合はオールゼロとする。
ＶｅｒＮｏ（２バイト）
意味：フォーマットのバージョン番号。
機能：上位がメジャーバージョン番号、下位がマイナーバージョン番号。
値：例 ０ｘ０１００（Ｖｅｒ１．０）
０ｘ０２０３（Ｖｅｒ２．３）
【００７５】上述したヘッダに続く領域に書かれるデータは以下のようになる。
【００７６】ＮＭ１－Ｓ
意味：メモリカード全体に関する１バイトの名前。
機能：１バイトの文字コードで表した可変長の名前データ（最大で２５６）。名前データの終了は、必ず終端コード（０ｘ００）を書き込む。サイズはこの終端コードから計算する。データの無い場合は少なくとも先頭（０ｘ００２０）からヌル（０ｘ００）を１バイト以上記録する。
値：各種文字コード
ＮＭ２－Ｓ
意味：メモリカード全体に関する２バイトの名前。
機能：２バイトの文字コードで表した可変長の名前データ（最大で５１２）。名前データの終了は、必ず終端コード（０ｘ００）を書き込む。サイズはこの終端コードから計算する。データの無い場合は少なくとも先頭（０ｘ０１２０）からヌル（０ｘ００）を２バイト以上記録する。
値：各種文字コード。
【００７７】ＣＯＮＴＥＮＴＳ ＫＥＹ
意味：曲ごとに用意された値。
ＭＧ（Ｍ）で保護されてから保存される。ここでは、１曲目に付けられるＣＯＮＴＥＮＴＳ ＫＥＹと同じ値となる。
機能：Ｓ－ＹＭＤｈｍｓのＭＡＣの計算に必要な鍵となる。
値：０から０ｘＦＦＦＦＦＦＦＦＦＦＦＦＦＦＦＦまで。
ＭＡＣ
意味：著作権情報改ざんチェック値
機能：Ｓ－ＹＭＤｈｍｓの内容とＣＯＮＴＥＮＴＳ ＫＥＹから作成される値
値：０から０ｘＦＦＦＦＦＦＦＦＦＦＦＦＦＦＦＦまで。
【００７８】ＴＲＫ－ｎｎｎ
意味：再生するＡＴＲＡＣ３データファイルのＳＱＮ（シーケンス）番号
機能：ＴＲＫＩＮＦの中のＦＮｏを記述する。
値：１から４００（０ｘ１９０）
トラックが存在しない時はオールゼロとする。
ＩＮＦ－Ｓ
意味：メモリカード全体に関する付加情報データ（例えば写真、歌詞、解説等の情報）
機能：ヘッダを伴った可変長の付加情報データ。
複数の異なる付加情報が並べられることがある。それぞれにＩＤとデータサイズが付けられている。個々のヘッダを含む付加情報データは最小１６バイト以上で４バイトの整数倍の単位で構成される。その詳細については、後述する
値：付加情報データ構成を参照
Ｓ－ＹＭＤｈｍｓ（４バイト）（Ｏｐｔｉｏｎ）
意味：信頼できる時計を持つ機器で記録した年・月・日・時・分・秒
機能：最終記録日時を識別するための値、ＥＭＤの時は必須。
値：２５～３１ビット 年 ０～９９（１９８０～２０７９）
２１～２４ビット 月 ０～１２
１６～２０ビット 日 ０～３１
１１～１５ビット 時 ０～２３
０５～１０ビット 分 ０～５９
００～０４ビット 秒 ０～２９（２秒単位）。
【００７９】再生管理ファイルの最後のスロットとし

て、ヘッダ内のものと同一のＢＬＫＩＤ－ＴＬ０と、ＭＣｏｄｅと、ＲＥＶＩＳＩＯＮとが書かれる。

【００８０】例えば民生用オーディオ機器としては、メモリカードが記録中に抜かれたり、電源が切れることがあり、復活した時にこれらの異常の発生を検出することが必要とされる。上述したように、ＲＥＶＩＳＩＯＮはブロックの先頭と末尾に書き込むようにし、この値を書き換える度に＋１インクリメントするようにしている。従って若し、ブロックの途中で異常終了が発生すると、先頭と末尾のＲＥＶＩＳＩＯＮの値が一致せず、異常終了を検出することができる。このようにＲＥＶＩＳＩＯＮが２個存在することで、高い確率で異常終了を検出することができる。異常終了の検出時には、エラーメッセージの表示等の警告が発生する。

【００８１】また、１ブロック（１６ＫＢ）の先頭部分に固定値ＢＬＫＩＤ－ＴＬ０を挿入しているので、ＦＡＴが壊れた場合の修復の目安に固定値を使用できる。すなわち、各ブロックの先頭の固定値を見れば、ファイルの種類を判別することが可能である。しかも、この固定値ＢＬＫＩＤ－ＴＬ０は、ブロックのヘッダおよびブロックの終端部分に二重に記述するので、その信頼性のチェックを行うことができる。なお、再生管理ファイルＰＢＬＩＳＴの同一のものを二重に記録しても良い。

【００８２】なおＡＴＲＡＣ３データファイルは、再生管理ファイルと比較して、相当大きなデータ量（例えば数千のブロックが繋がる場合もある）であり、ＡＴＲＡＣ３データファイルに関しては、後述するように、ブロック番号ＢＬＯＣＫ　ＳＥＲＩＡＬが付けられている。但し、ＡＴＲＡＣ３データファイルは、通常複数のファイルがメモリカード上に存在するので、ＣＯＮＮＵＭ０でコンテンツの区別を付けた上で、ＢＬＯＣＫ　ＳＥＲＩＡＬを付けないと、重複が発生し、ＦＡＴが壊れた場合のファイルの復旧が困難となる。

【００８３】同様に、ＦＡＴの破壊までにはいたらないが、論理を間違ってファイルとして不都合のあるような場合に、書き込んだメーカーの機種が特定できるように、メーカーコード（ＭＣｏｄｅ）がブロックの先頭と末尾に記録されている。

【００８４】図１３は、再生管理ファイルに記録される付加情報データ（ＩＮＦ－Ｓ）の構成を示す。付加情報の先頭に下記のヘッダが書かれる。ヘッダ以降に可変長のデータが書かれる。

【００８５】ＩＮＦ
意味：FIELD ID
機能：付加情報データの先頭を示す固定値。
値：０ｘ６９
ＩＤ
意味：付加情報キーコード
機能：付加情報の分類を示す。
値：０から０ｘＦＦ
ＳＩＺＥ
意味：個別の付加情報の大きさ
機能：データサイズは自由であるが、必ず４バイトの整数倍でなければならない。また、最小１６バイト以上のこと。データの終わりより余りがでる場合はヌル（０ｘ００）で埋めておく。
値：１６から１４７８４（０ｘ３９Ｃ０）
ＭＣｏｄｅ
意味：MAKER CODE
機能：記録した機器の、メーカー、モデルを識別するコード。
値：上位１０ビット（メーカーコード）　下位６ビット（機種コード）
Ｃ＋Ｌ
意味：先頭から１２バイト目からのデータ領域に書かれる文字の属性を表す
機能：使用する文字コードと言語コードを各１バイトで表す。
値：前述のＳＮＩＣ＋Ｌと同じ
ＤＡＴＡ
意味：個別の付加情報データ
機能：可変長データで表す。実データの先頭は常に１２バイト目より始まり、長さ（サイズ）は最小４バイト以上、常に４バイトの整数倍でなければならない。データの最後から余りがある場合はヌル（０ｘ００）で埋める。
値：内容により個別に定義される。

【００８６】図１４は、付加情報キーコードの値（０～６３）と、付加情報の種類の対応の一例を示す。キーコードの値（０～３１）が音楽関係（文字情報）に対して割り当てられ、その（３２～６３）がＵＲＬ(Uniform Resource Locator)（Ｗｅｂ関係）に対して割り当てられている。アルバムタイトル、アーティスト名、ＣＭ等の文字情報が付加情報として記録される。

【００８７】図１５は、付加情報キーコードの値（６４～１２７）と、付加情報の種類の対応の一例を示す。キーコードの値（６４～９５）がバス／その他に対して割り当てられ、その（９６～１２７）が制御／数値・データ関係に対して割り当てられている。例えば（ＩＤ＝９８）の場合では、付加情報がＴＯＣ－ＩＤとされる。ＴＯＣ－ＩＤは、ＣＤ（コンパクトディスク）のＴＯＣ情報に基づいて、最初の曲番号、最後の曲番号、その曲番号、総演奏時間、その曲演奏時間を示すものである。

【００８８】図１６は、付加情報キーコードの値（１２８～１５９）と、付加情報の種類の対応の一例を示す。キーコードの値（１２８～１５９）が同期再生関係に対して割り当てられている。図１６中のＥＭＤ(Electronic Music Distribution)は、電子音楽配信の意味である。

【００８９】図１７を参照して付加情報のデータの具体

例について説明する。図１７（ａ）は、図１３と同様に、付加情報のデータ構成を示す。図１７（ｂ）は、キーコードＩＤ＝３とされる、付加情報がアーティスト名の例である。ＳＩＺＥ＝０ｘ１Ｃ（２８バイト）とされ、ヘッダを含むこの付加情報のデータ長が２８バイトであることが示される。また、Ｃ＋Ｌが文字コードＣ＝０ｘ０１とされ、言語コードＬ＝０ｘ０９とされる。この値は、前述した規定によって、ＡＳＣＩＩの文字コードで、英語の言語であることを示す。そして、先頭から１２バイト目から１バイトデータでもって、「ＳＩＭＯＮ＆ＧＲＡＦＵＮＫＥＬ」のアーティスト名のデータが書かれる。付加情報のサイズは、４バイトの整数倍と決められているので、１バイトの余りが（０ｘ００）とされる。

【００９０】図１７（ｃ）は、キーコードＩＤ＝９７とされる、付加情報がＩＳＲＣ(International Standard Recording Code：著作権コード）の例である。ＳＩＺＥ＝０ｘ１４（２０バイト）とされ、この付加情報のデータ長が２０バイトであることが示される。また、Ｃ＋ＬがＣ＝０ｘ００、Ｌ＝０ｘ００とされ、文字、言語の設定が無いこと、すなわち、データが２進数であることが示される。そして、データとして８バイトのＩＳＲＣのコードが書かれる。ＩＳＲＣは、著作権情報（国、所有者、録音年、シリアル番号）を示すものである。

【００９１】図１７（ｄ）は、キーコードＩＤ＝９７とされる、付加情報が録音日時の例である。ＳＩＺＥ＝０ｘ１０（１６バイト）とされ、この付加情報のデータ長が１６バイトであることが示される。また、Ｃ＋ＬがＣ＝０ｘ００、Ｌ＝０ｘ００とされ、文字、言語の設定が無いことが示される。そして、データとして４バイト（３２ビット）のコードが書かれ、録音日時（年、月、日、時、分、秒）が表される。

【００９２】図１７（ｅ）は、キーコードＩＤ＝１０７とされる、付加情報が再生ログの例である。ＳＩＺＥ＝０ｘ１０（１６バイト）とされ、この付加情報のデータ長が１６バイトであることが示される。また、Ｃ＋ＬがＣ＝０ｘ００、Ｌ＝０ｘ００とされ、文字、言語の設定が無いことが示される。そして、データとして４バイト（３２ビット）のコードが書かれ、再生ログ（年、月、日、時、分、秒）が表される。再生ログ機能を持つものは、１回の再生毎に１６バイトのデータを記録する。

【００９３】３－５　データファイル

図１８は、１ＳＵがＮバイト（例えばＮ＝３８４バイト）の場合のＡＴＲＡＣ３データファイル（Ａ３Ｄｎｎｎ）のデータ配列を示す。図１８には、図８で示したようなデータファイルとして、属性ヘッダとしてのブロックと、実際に音楽データが記録されるブロックとが示されている。図１８には各ブロック（１６×２＝３２Ｋバイト）の各スロットの先頭のバイト（０ｘ０００００～０ｘ７ＦＦ０）が示されている。

【００９４】図１８に示すように、属性ヘッダの先頭から３２バイトはヘッダとされ、２５６バイトが曲名領域ＮＭ１（２５６バイト）であり、５１２バイトが曲名領域ＮＭ２（５１２バイト）である。属性ヘッダのヘッダには、下記のデータが書かれる。

【００９５】ＢＬＫＩＤ－ＨＤ０（４バイト）

意味：ＢＬＯＣＫＩＤ　ＦＩＬＥ　ＩＤ

機能：ＡＴＲＡＣ３データファイルの先頭であることを識別するための値。

値：固定値＝”ＨＤ＝０”（例えば０ｘ４８４４２Ｄ３０）

ＭＣｏｄｅ（２バイト）

意味：ＭＡＫＥＲ　ＣＯＤＥ

機能：記録した機器の、メーカー、モデルを識別するコード。

値：上位１０ビット（メーカーコード）　下位６ビット（機種コード）

ＢＬＯＣＫ　ＳＥＲＩＡＬ（４バイト）

意味：トラック毎に付けられた連続番号

機能：ブロックの先頭は０から始まり次のブロックは＋１づつインクリメント編集されても値を変化させない。

値：０より始まり０ｘＦＦＦＦＦＦＦＦまで。

【００９６】Ｎ１Ｃ＋Ｌ（２バイト）

意味：トラック（曲名）データ（ＮＭ１）の属性

機能：ＮＭ１に使用される文字コードと言語コードを各１バイトで表す。

値：ＳＮ１Ｃ＋Ｌと同一

Ｎ２Ｃ＋Ｌ（２バイト）

意味：トラック（曲名）データ（ＮＭ２）の属性

機能：ＮＭ２に使用される文字コードと言語コードを各１バイトで表す。

値：ＳＮ１Ｃ＋Ｌと同一

ＩＮＦＳＩＺＥ（２バイト）

意味：トラックに関する付加情報の全てを合計したサイズ

機能：データサイズを１６バイト単位の大きさで記述。無い場合は必ずオールゼロとする。

値：サイズは０ｘ０００００から０ｘ３Ｃ６（９６６）

Ｔ－ＰＲＴ（２バイト）

意味：トータルパーツ数

機能：トラックを構成するパーツ数を表す。通常は１。

値：１から０ｘ２８５（６４５dec）

Ｔ－ＳＵ（４バイト）

意味：トータルＳＵ数

機能：１トラック中の実際の総ＳＵ数を表す。曲の演奏時間に相当する。

値：０ｘ０１から０ｘ００１ＦＦＦＦＦ

ＩＮＸ（２バイト）（Ｏｐｔｉｏｎ）

意味：INDEX の相対場所

機能：曲のさびの部分（特徴的な部分）の先頭を示すポ

インタ。曲の先頭からの位置をＳＵの個数を１／４した数で指定する。これは、通常のＳＵの４倍の長さの時間（約９３ｍ秒）に相当する。
値：０から０ｘＦＦＦＦ（最大、約６０８４秒）
ＸＴ（２バイト）（Ｏｐｔｉｏｎ）
意味：INDEX の再生時間
機能：ＩＮＸ-nnnで指定された先頭から再生すべき時間のＳＵの個数を１／４した数で指定する。これは、通常のＳＵの４倍の長さの時間（約９３ｍ秒）に相当する。
値：０ｘ０００：無設定　０ｘ０１から０ｘＦＦＥ（最大６０８４秒）０ｘＦＦＦＦ：曲の終わりまで。
【００９７】次に属性ヘッダにおける曲名領域ＮＭ１およびＮＭ２について説明する。
【００９８】ＮＭ１
意味：曲名を表す文字列
機能：１バイトの文字コードで表した可変長の曲名（最大で２５６）。名前データの終了は、必ず終端コード（０ｘ００）を書き込む。サイズはこの終端コードから計算する。データの無い場合は少なくとも先頭（０ｘ００２０）からヌル（０ｘ００）を１バイト以上記録する。
値：各種文字コード
ＮＭ２
意味：曲名を表す文字列
機能：２バイトの文字コードで表した可変長の名前データ（最大で５１２）。名前データの終了は、必ず終端コード（０ｘ００）を書き込む。サイズはこの終端コードから計算する。データの無い場合は少なくとも先頭（０ｘ０１２０）からヌル（０ｘ００）を２バイト以上記録する。
値：各種文字コード。
【００９９】属性ヘッダの固定位置（０ｘ０３２０）から始まる、８０バイトのデータをトラック情報領域ＴＲＫＩＮＦと呼び、主としてセキュリティ関係、コピー制御関係の情報を一括して管理する。ＴＲＫＩＮＦ内のデータについて、配置順序に従って以下に説明する。
【０１００】ＣＯＮＴＥＮＴＳ　ＫＥＹ（８バイト）
意味：曲毎に用意された値で、メモリカードのセキュリティブロックで保護されてから保存される。
機能：曲を再生する時、まず必要となる最初の鍵となる。Ｃ－ＭＡＣ［ｎ］計算時に使用される。
値：０から０ｘＦＦＦＦＦＦＦＦＦＦＦＦＦＦＦＦまで
Ｃ－ＭＡＣ［ｎ］（８バイト）
意味：著作権情報改ざんチェック値
機能：コンテンツ累積番号を含む複数のＴＲＫＩＮＦの内容と隠しシーケンス番号から作成される値。隠しシーケンス番号とは、メモリカードの隠し領域に記録されているシーケンス番号のことである。著作権対応でないレコーダは、隠し領域を読むことができない。また、著作権対応の専用のレコーダ、またはメモリカードを読むことを可能とするアプリケーションを搭載したパーソナルコンピュータは、隠し領域をアクセスすることができる。

【０１０１】Ａ（１バイト）
意味：パーツの属性
機能：パーツ内の圧縮モード等の情報を示す
値：図１９を参照して以下に説明する
ただし、Ｎ＝０，１のモノラルは、ｂｉｔ７が１でサブ信号を０、メイン信号（Ｌ＋Ｒ）のみの特別なＪｏｉｎｔモードをモノラルとして規定する。ｂｉｔ２，１の情報は通常の再生機は無視しても構わない。
【０１０２】Ａのビット０は、エンファシスのオン／オフの情報を形成し、ビット１は、再生ＳＫＩＰか、通常再生かの情報を形成し、ビット２は、データ区分、例えばオーディオデータか、ＦＡＸ等の他のデータかの情報を形成する。ビット３は、未定義である。ビット４、５、６を組み合わせることによって、図示のように、レート情報が規定される。すなわち、Ｎは、この３ビットで表されるレートの値であり、モノ（Ｎ＝０，１），ＬＰ（Ｎ＝２），ＳＰ（Ｎ＝４），ＥＸ（Ｎ＝５，６），ＨＱ（Ｎ＝７）の５種類のモードについて、記録時間（６４ＭＢのメモリカードの場合）、データ転送レート、１ブロック内のＳＵ数、１ＳＵのバイト数がそれぞれ示されている。ビット７は、ＡＴＲＡＣ３のモード（０：Dual　１：Joint ）が示される。
【０１０３】一例として、６４ＭＢのメモリカードを使用し、ＳＰモードの場合について説明する。６４ＭＢのメモリカードには、３９６８ブロックがある。ＳＰモードでは、１ＳＵが３０４バイトであるので、１ブロックに５３ＳＵが存在する。１ＳＵは、（１０２４／４４１００）秒に相当する。従って、１ブロックは、
（１０２４／４４１００）×５３×（３９６８－１６）＝４８６３秒＝８１分
転送レートは、
（４４１００／１０２４）×３０４×８＝１０４７３７ bps
となる。
【０１０４】ＬＴ（１バイト）
意味：再生制限フラグ（ビット７およびビット６）とセキュリティバージョン（ビット５～ビット０）
機能：このトラックに関して制限事項があることを表す。
値：ビット７：　０＝制限なし　　１＝制限有り
ビット６：　０＝期限内　　１＝期限切れ
ビット５～ビット０：セキュリティバージョン０（０以外であれば再生禁止とする）
ＦＮｏ（２バイト）
意味：ファイル番号
機能：最初に記録された時のトラック番号であり、且つこの値は、メモリカード内の隠し領域に記録されたＭＡ

Ｃ計算用の値の位置を特定する。
値：１から０ｘ１９０（４００）
ＭＧ（Ｄ）ＳＥＲＩＡＬ－ｎｎｎ（１６バイト）
意味：記録機器のセキュリティブロック（セキュリティＩＣ２０）のシリアル番号。
機能：記録機器ごとに全て異なる固有の値。
値：０から0xFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
ＣＯＮＮＵＭ（４バイト）
意味：コンテンツ累積番号
機能：曲毎に累積されていく固有の値で記録機器のセキュリティブロックによって管理される。２の３２乗、４２億曲分用意されており、記録した曲の識別に使用する。
【０１０５】値：０から０ｘＦＦＦＦＦＦＦＦ。
【０１０６】ＹＭＤｈｍｓ－Ｓ（４バイト）（Ｏｐｔｉｏｎ）
意味：再生制限付きのトラックの再生開始日時
機能：ＥＭＤで指定する再生開始を許可する日時。
値：上述した日時の表記と同じ。
ＹＭＤｈｍｓ－Ｅ（４バイト）（Ｏｐｔｉｏｎ）
意味：再生制限付きのトラックの再生終了日時
機能：ＥＭＤで指定する再生許可を終了する日時。
値：上述した日時の表記と同じ。
ＭＴ（１バイト）（Ｏｐｔｉｏｎ）
意味：再生許可回数の最大値
機能：ＥＭＤで指定される最大の再生回数。
値：１から０ｘＦＦ　未使用の時は、０ｘ００である。ＬＴのｂｉｔ７の値が０の場合はＭＴの値は００とする。
ＣＴ（１バイト）（Ｏｐｔｉｏｎ）
意味：再生回数
機能：再生許可された回数の内で、実際に再生できる回数。再生の度にデクリメントする。
値：０ｘ００～０ｘＦＦ　未使用の時は、０ｘ００である。ＬＴのｂｉｔ７が１でＣＴの値が００の場合は再生を禁止する。
【０１０７】ＣＣ（１バイト）
意味：COPY CONTROL
機能：コピー制御
値：図２０に示すように、ビット６および７によってコピー制御情報を表し、ビット４および５によって高速ディジタルコピーに関するコピー制御情報を表し、ビット１，２，３によってコピー属性を表す。ビット０は未定義である。
ＣＣの例：
ビット７・・・０：コピー禁止、１：コピー許可
ビット６・・・０：オリジナル、１：第１世代以上
ビット５，４・・・００：コピー禁止、０１：コピー第１世代、１０：コピー可
ビット３，２，１
００１：オリジナルソースから記録したコンテンツであることを示す。
０１０：ＬＣＭからコピーしたコンテンツであることを示す。
０１１：ＬＣＭからムーブしたコンテンツであることを示す。
１００以上：未定義。
なおＬＣＭとは、Licensed Compliant Moduleであり、例えばパーソナルコンピュータやコンシューマ機器におけるＨＤＤなどが相当する。例えばＣＤからのディジタル録音では（ｂｉｔ７，６）は０１、（ｂｉｔ５，４）は００、（ｂｉｔ３，２，１）は００１或いは０１０となる。
【０１０８】ＣＮ（１バイト）（Ｏｐｔｉｏｎ）
意味：高速ディジタルコピーＨＳＣＭＳ(High speed Serial Copy ManagementSystem)におけるコピー許可回数
機能：コピー１回か、コピーフリーかの区別を拡張し、回数で指定する。コピー第１世代の場合にのみ有効であり、コピーごとに減算する。
値：００：コピー禁止、０１から０ｘＦＥ：回数、０ｘＦＦ：回数無制限。
【０１０９】データファイルにおける属性ヘッダにおいては、以上のようなトラック情報領域ＴＲＫＩＮＦに続いて、０ｘ０３７０から始まる２４バイトのデータをパーツ管理用のパーツ情報領域ＰＲＴＩＮＦと呼び、１つのトラックを複数のパーツで構成する場合に、時間軸の順番にＰＲＴＩＮＦを並べていく。ＰＲＴＩＮＦ内のデータについて、配置順序に従って以下に説明する。
【０１１０】ＰＲＴＳＩＺＥ（４バイト）
意味：パーツサイズ
機能：パーツの大きさを表す。クラスタ：２バイト（最上位）、開始ＳＵ：１バイト（上位）、終了ＳＵ：１バイト（最下位）
値：クラスタ：１から０ｘ１Ｆ４０（８０００）、開始ＳＵ：０から０ｘＡ０（１６０）、終了ＳＵ：０から０ｘＡ０（１６０）（但し、ＳＵの数え方は、０，１，２，と０から開始する）
ＰＲＴＫＥＹ（８バイト）
意味：パーツを暗号化するための値
機能：初期値＝０、編集時は編集の規則に従う。
値：０から０ｘＦＦＦＦＦＦＦＦＦＦＦＦＦＦＦＦ
ＣＯＮＮＵＭ０（４バイト）
意味：最初に作られたコンテンツ累積番号キー
機能：コンテンツをユニークにするためのＩＤの役割。
値：コンテンツ累積番号初期値キーと同じ値とされる。
【０１１１】ＡＴＲＡＣ３データファイルの属性ヘッダ中には、図１８に示すように、付加情報ＩＮＦが含まれる。この付加情報は、開始位置が固定化されていない点を除いて、再生管理ファイル中の付加情報ＩＮＦ－Ｓ（図１２参照）と同一である。１つまたは複数のパーツ

の最後のバイト部分（４バイト単位）の次を開始位置として付加情報ＩＮＦのデータが開始する。

【０１１２】ＩＮＦ

意味：トラックに関する付加情報データ

機能：ヘッダを伴った可変長の付加情報データ。複数の異なる付加情報が並べられることがある。それぞれにＩＤとデータサイズが付加されている。個々のヘッダを含む付加情報データは、最小１６バイト以上で４バイトの整数倍の単位

値：再生管理ファイル中の付加情報ＩＮＦ－Ｓと同じである。

【０１１３】以上のような属性ヘッダに対して、ＡＴＲＡＣ３データが記録される各ブロックのデータが続く。図８にも示したように、ブロック毎にヘッダが付加される。図１８に示す、ブロック内のデータについて以下に説明する。

【０１１４】ＢＬＫＩＤ－Ａ３Ｄ（４バイト）

意味：BLOCKID FILE ID

機能：ＡＴＲＡＣ３データの先頭であることを識別するための値。

値：固定値＝”Ａ３Ｄ”（例えば０ｘ４１３３４４２０）

ＭＣｏｄｅ（２バイト）

意味：MAKER CODE

機能：記録した機器の、メーカー、モデルを識別するコード。

値：上位１０ビット（メーカーコード）　下位６ビット（機種コード）

ＣＯＮＮＵＭ０（４バイト）

意味：最初に作られたコンテンツ累積番号

機能：コンテンツをユニークにするためのＩＤの役割、編集されても値は変化させない。

値：コンテンツ累積番号初期値キーと同じ値とされる。

ＢＬＯＣＫ　ＳＥＲＩＡＬ（４バイト）

意味：トラック毎に付けられた連続番号

機能：ブロックの先頭は０から始まり次のブロックは＋１づつインクリメント編集されても値を変化させない。

値：０より始まり０ｘＦＦＦＦＦＦＦＦまで。

ＢＬＯＣＫ－ＳＥＥＤ（８バイト）

意味：１ブロックを暗号化するための１つの鍵

機能：ブロックの先頭は、記録機器のセキュリティブロックで乱数を生成、続くブロックは、＋１インクリメントされた値。この値が失われると、１ブロックに相当する約１秒間、音が出せないために、ヘッダとブロック末尾に同じものが二重に書かれる。編集されても値を変化させない。

値：初期は８バイトの乱数。

ＩＮＩＴＩＡＬＩＺＡＴＩＯＮ　ＶＥＣＴＯＲ（８バイト）

意味：ブロック毎にＡＴＲＡＣ３データを暗号化、復号化する時に必要な初期値

機能：ブロックの先頭は０から始まり、次のブロックは最後のＳＵの最後の暗号化された８バイトの値。デバイドされたブロックの途中からの場合は開始ＳＵの直前の最後の８バイトを用いる。編集されても値を変化させない。

値：０から０ｘＦＦＦＦＦＦＦＦＦＦＦＦＦＦＦＦ

ＳＵ－ｎｎｎ

意味：サウンドユニットのデータ

機能：１０２４サンプルから圧縮されたデータ、圧縮モードにより出力されるバイト数が異なる。編集されても値を変化させない（一例として、ＳＰモードの時では、Ｎ＝３８４バイト）。

値：ＡＴＲＡＣ３のデータ値。

【０１１５】図１８では、Ｎ＝３８４であるので、１ブロックに４２ＳＵが書かれる。また、１ブロックの先頭の２つのスロット（４バイト）がヘッダとされ、最後の１スロット（２バイト）にＢＬＫＩＤ－Ａ３Ｄ、ＭＣｏｄｅ、ＣＯＮＮＵＭ０、ＢＬＯＣＫ　ＳＥＲＩＡＬが二重に書かれる。従って、１ブロックの余りの領域Ｍバイトは、（１６，３８４－３８４×４２－１６×３＝２０８（バイト）となる。この中に上述したように、８バイトのＢＬＯＣＫ　ＳＥＥＤが二重に記録される。

【０１１６】４．記録処理

４－１　処理例１

以下、本例のレコーダ１によるコンテンツ（曲）の記録動作時の処理例について説明していく。上述してきた説明から理解されるように、メモリカード４０に対するコンテンツの記録は、コンテンツデータの記録だけではなく、１ブロック（１クラスタ）分の容量である再生管理ファイルの生成又は更新があって、完了するものである。またコンテンツのデバイド、コンバイン等の編集は再生管理ファイルの更新によって実現される。また、メモリカード４０上での再生管理ファイルの記録位置（絶対アドレス）は、再生管理ファイルの更新のための書込のたびに異なる位置とされていく。さらに、デバイド編集が行われる場合は、１クラスタ（１ブロック）を新たに使用することが必要となる。

【０１１７】このような事情から、もしコンテンツの記録をメモリカードの全ての容量に対して行ってしまうと、その記録動作にかかる再生管理ファイルの作成又は更新ができなくなる。或いは、コンテンツと再生管理ファイルを含めてメモリカードの全ての容量を使い切ってしまうと、その後、デバイド等の編集ができないものとなってしまう。そこで本例では、記録動作時には、或る程度の容量が残されるようにして記録が終了するようにするものである。ただ、このような処理により、コンテンツを記録できる容量が、残される容量の分だけ減ることになるため、残される容量は適切な量としなければならない。

【０１１８】一般に平均的な演奏時間の音楽を記録する場合、１つの記録媒体（メモリカード）の曲数（コンテンツ数）は２０曲程度までとなる。また、ＦＭ放送等を１時間分録音した場合は、その１時間分のデータは１つのコンテンツとして扱われる。ユーザーは、録音した放送からデバイドによって、各曲を分割する操作を行う。これらの事情から、２０回程度のデバイドが行われる可能性が高いとして、例えば２０クラスタ（２０ブロック）分程度を、上記の残される容量とする方式が考えられる。また、既に１０曲（３０分）のコンテンツが記録されているような状態では、統計的にはあと１０クラスタ（１０ブロック）分程度を、上記の残される容量とすれば、その後のデバイド編集などに、ほぼ対応できると推定できる。そこで、記録開始時に、既に記録されているコンテンツ数に応じて、残される容量を設定する方式も考えられる。或いは、既に記録されているコンテンツの平均的なサイズと全容量の関係から残される容量を設定するようにしてもよい。大まかにいえば、メモリカードにおいてコンテンツ数が少なくその各コンテンツのサイズが大きい場合は、その後に何回か編集される可能性が高くなるため、その傾向に応じて、残される容量を設定すると好適である。

【０１１９】いづれにしても本例では、記録後における編集回数の可能性に応じて、残される容量が設定されるようにする。

【０１２０】レコーダ１のＤＳＰ３０が、ライン入力セレクタ１３又はデジタル入力セレクタ１６から入力され、オーディオエンコーダ／デコーダ１０でエンコード処理、セキュリティＩＣ２０で暗号化処理が施されたデータを、メモリカード４０に記録していく際の処理を図２１に示す。

【０１２１】記録が開始される際には、ＤＳＰ３０は、まずステップＦ１０１で、装填されているメモリカード４０の管理情報（再生管理ファイル）から、メモリカード４０に既にコンテンツ（データファイル）が記録されているか否かを判別する。まだ１つもデータファイルが記録されていないメモリカード４０であった場合は、処理をステップＦ１０２に進め、変数Ｌに「２０」をセットする。これは上述のように、通常、２０曲程度の収録状態が考えられ、換言すれば２０回程度のデバイドが行われる可能性が考えられるためである。もちろん「２０」という値は一例にすぎず、メモリカードの容量等に応じて適切な値が設定されるべきである。また、この「２０」に相当する値を、ユーザーが自分の事情や記録内容、例えば編集を何回も行うか否かに合わせて、任意に増減できるようにしてもよい。

【０１２２】そしてステップＦ１０８で、Ｌクラスタ、即ちこの場合は２０クラスタ（２０ブロック）分を、余りブロックとして確保する。ここでいう余りブロックとは、上述した残される容量のことであり、つまり記録終了時点で残されるべき容量としてのブロック数である。

【０１２３】メモリカード４０にすでに１つ以上のデータファイルが記録されていた場合は、ＤＳＰ３０の処理はステップＦ１０３に進み、記録されているデータファイルの平均ファイルサイズＭを算出する。これは、既にデータファイルの記録に使用されている容量を、データファイル数で割れば算出できる。平均ファイルサイズＭが算出できたら、ステップＦ１０４で、メモリカード４０の全容量を平均ファイルサイズＭで割って、予測総ファイル数Ｎを算出する。予測総ファイル数Ｎとは、メモリカード４０の全容量を使用した場合に、いくつのデータファイルが記録されているかの予測値である。

【０１２４】そしてＤＳＰ３０はステップＦ１０５で予測総ファイル数Ｎが「２０」以下であるか否かを判別する。ここでの「２０」も、一般的な平均としての収録曲数として用いており、「２０」に限定されるものではない。

【０１２５】予測総ファイル数Ｎが「２０」以下である場合は、２０曲は記録される可能性があると判断して、ステップＦ１０６で、「２０」から既に記録されているデータファイル数を減算した値を、変数Ｌにセットする。そしてステップＦ１０８で、Ｌクラスタ（Ｌブロック）分を、余りブロックとして確保する。

【０１２６】一方、ステップＦ１０５で、予測総ファイル数Ｎが「２０」を越えているとされた場合は、予測総ファイル数Ｎの数だけデータファイルが記録される可能性があると判断して、ステップＦ１０７で、予測総ファイル数Ｎから既に記録されているデータファイル数を減算した値を、変数Ｌにセットする。そしてステップＦ１０８で、Ｌクラスタ（Ｌブロック）分を、余りブロックとして確保する。

【０１２７】ステップＦ１０８として余りブロックが設定されたら、ステップＦ１０９からオーディオデータによるデータファイルの記録を開始する。データファイルは上述したようにブロック単位で記録されていくことになる。

【０１２８】記録動作中は、ステップＦ１１０で、余りブロックを除いてメモリカード４０における記録可能な残り容量がゼロになったか否かを監視している。またステップＦ１１１では、記録終了、即ちユーザの指示した１又は複数のデータファイルの記録が完了したか、或いはユーザーが操作部３９から記録停止操作を行ったことなどにより記録が終了されるものとなったか、を監視する。さらにステップＦ１１２では、供給されているオーディオデータとして、ファイルチェンジ、即ち曲が変わって、別のデータファイルの記録に移行することになったかを監視する。このファイルチェンジ、即ち曲の変化は、例えばＭＤ、ＣＤ等の記録媒体から曲がデジタルオーディオデータとして供給されている場合において、そのデジタルデータ内に含まれているトラックナンバ情報

を監視することなどで可能となる。また、ライン入力セレクタ１３からのアナログオーディオ信号について記録している場合でも、例えば無音期間の検出などにより、ファイルチェンジと判断するようにしてもよい。

【０１２９】ステップＦ１１０で肯定結果がでるより前に、ステップＦ１１１で記録終了となった場合は、ＤＳＰ３０はステップＦ１１８で、記録したコンテンツについての再生管理ファイルの作成（又は更新）を行って、記録処理を終える。この場合は、メモリカード４０における記録可能な容量は、その後の記録や編集のためには、まだ十分に残されている状態である。

【０１３０】記録動作中においてステップＦ１１２で、記録するオーディオデータについてのファイルチェンジが検出された場合は、そのファイルチェンジポイントまでのオーディオデータが記録されたブロックで、１つのデータファイルが形成されることになる。そこでステップＦ１１３で変数Ｌをデクリメントし、その時点で変数Ｌが「１」よりも大きければ、ステップＦ１０８に戻って、Ｌクラスタ分を余りブロックとして確保する。つまり余りブロックとしての設定を１ブロック少なくする。これは、１つのデータファイルが記録されたことで、その後のデバイド回数の可能性が１回減ったと考えることができるためである。そして、ステップＦ１０９から新たなデータファイルとして、続くオーディオデータを新たなブロックの先頭とした上で、その後の記録を行っていく。

【０１３１】なお、記録中に１９回トラックチェンジが検出されると、ステップＦ１１４の時点で変数Ｌ＝０となる。そしてこれは、続くオーディオデータが、２０曲目として記録されていく場合である。この場合、録音後においてデバイド編集が行われる可能性がきわめて低いものとなるため、それだけを考えれば、変数Ｌ＝０となることに応じて、余りブロックをゼロとしてしまってもよいが、実際には録音後に再生管理ファイルの書込が必要となるため、少なくとも録音終了時点で１ブロックは残されていなければならない。そこで、ステップＦ１１４で変数Ｌが１未満（つまり０）となった場合は、ステップＦ１１６で、変数Ｌ＝１として、ステップＦ１０８で少なくとも１ブロックは余りブロックとして確保されるようにする。また、この場合、余りブロックが記録終了後の再生管理ファイルの書込に用いられ、それによってメモリカード４０の全容量が消費されると、その後の編集はできないものとなる。そこで、ステップＦ１１５では、ユーザーに対して記録終了後の編集ができなくなるおそれがあることを提示する。例えば表示部３３にその旨のメッセージを表示する。但し、その後、ステップＦ１１０で肯定結果が出る前に、ステップＦ１１１で記録終了と判断された場合、即ち余りブロック以外にも記録可能なブロックが残されている場合は、まだ記録又は編集が可能であるため、この時点では必ずしも警告表示を行わなくてもよい。

【０１３２】ステップＦ１１０において、その時点で余りエリアとして設定されているブロック数を残して、他に記録可能なブロックが使い切られてしまったと判断された場合は、ＤＳＰ３０はステップＦ１１７に進み、強制的に記録動作を停止する。そしてステップＦ１１８で記録したコンテンツについての再生管理ファイルの作成（又は更新）を行って、記録処理を終える。この場合は、メモリカード４０における記録可能な容量は、余りエリアとして設定されていたブロック数のみが残されている状態である。そしてその余りブロックとしてのブロック数は、上述したように、通常２０曲が収録されること、平均データサイズと全容量の関係から収録曲数が推定されること、及びそれらの収録曲数から、既に収録済みの曲数が減算されることなどに応じて設定される。さらに記録中に曲が分かれれば（ファイルチェンジ）、余りブロック数はデクリメントされていく。これらのことから、記録終了時点で、その後に少なくとも一般的に予測されるだけの編集回数は、編集可能とするに足りるブロック数となる。従って、コンテンツ記録時に、ユーザーがメモリカード４０の記録可能エリアを使い切ってしまったと感じる場合でも、少なくとも通常必要となる回数の編集は、可能とされることになり、ユーザーに不都合を感じさせるものではなくなる。また一方で、上記のように余りブロック数が変数Ｌに応じて設定され、また記録中にデクリメントされることで、余りブロック数は、通常必要とされる編集回数を、コンテンツ記録状況に応じて、最低限の回数として設定されるものとなる。これは、余りブロック数を多く設定しすぎて、それによりコンテンツの記録可能容量を必要以上に小さくしてしまうものではないことを意味する。つまり、本例の記録処理により、なるべくコンテンツの記録容量は減少させないようにした上で、その後に必要とされる編集は実行可能な状態とすることができる。

【０１３３】なお、上述のように余りブロックが１ブロックまで減ぜられた状態で、ステップＦ１１０，Ｆ１１７で記録が終了されると、その余りブロックとされた１ブロックは、再生管理ファイルの記録に用いられるものとなり、その時点で全てのブロックが使用済みとなる。つまり以降は、編集ができない。（本例の考え方によれば、この場合は、２０或いはそれ以上の曲数に既に分割されているため、デバイド編集の必要がない状態となっている）。そこで、ステップＦ１１５として説明した警告処理は、このような場合に実行するようにしてもよい。またその時点で、編集操作を無効とする編集禁止処理を行ってもよい。なお、この場合において、再生管理ファイルが新規に或るブロックに記録されるのではなく、いままでの再生管理ファイルが「更新」される場合は、旧再生管理ファイルが記録されていたブロックは、書込可能なブロックとなる。従って、コンバイン、ムー

ブ、イレーズなど、再生管理ファイルの更新のみで実現される編集は可能である。そこで、そのような場合は、上記警告や編集禁止処理は、デバイド編集に限ったものとして行ってもよい。

【０１３４】ところで、以上の処理の説明では、記録終了時点のステップＦ１１８での再生管理ファイルの書込に用いるブロックも、少なくとも余りブロックとして確保されるものとして説明したが、ステップＦ１１８での再生管理ファイルの書込に用いるブロックは、「余りブロック」とは別に確保されているとして、図２１の処理を考えてもよい。その場合、上記のように余りブロックが１ブロックまで減ぜられた状態で、ステップＦ１１０，Ｆ１１７で記録が終了され、再生管理ファイルの記録が行われても、余りブロックとされた１ブロックは残されている。従って、コンバイン、ムーブ、イレーズなど、再生管理ファイルの更新のみで実現される編集は可能である。またさらに再生管理ファイルが更新された場合は、旧再生管理ファイルの記録されていたブロックも書込可能となるため、２ブロックが書き込み可能であり、デバイドも可能である。従って、上記警告表示や編集禁止処理は、これらの事情に応じて行うことが好ましい。

【０１３５】また、図２１の処理例では、ファイルチェンジに応じて余りブロック数が単純に減ぜられていくようにしたが、ファイルチェンジのタイミングまでのオーディオデータで形成されたデータファイルを含めて、ステップＦ１０３～Ｆ１０７のような平均ファイルサイズと全容量に応じた余りブロック設定が行われるようにして、余りブロックの設定が変化されていくようにしてもよい。

【０１３６】４－２　処理例２

続いて図２２で、処理例２としての記録処理を説明する。なお図２２において、上記図２１と同一の処理については、ステップＦ１０１～Ｆ１１８として同一ステップ番号を付し、説明を省略する。即ちこの処理例２は、上記図２１の処理に、ステップＦ１００及びＦ１１９～１２１が追加されたものである。

【０１３７】この場合は、ユーザーが、記録後における編集を可能とするために余りブロックを設定するか、或いは、そのようなことを考慮せずに、できるだけコンテンツの記録可能容量を多くするかを選択できるようにしたものである。つまりユーザーは、例えば操作部３９からの操作により、余りブロック量を除いた記録可能なブロック残量がゼロとなったら記録動作を終了させる動作モードと、メモリカード４０上で記録可能なブロック残量がゼロとなるまで記録動作を続行可能とする動作モード（使い切り設定）とを選択できるようにしている。

【０１３８】ユーザーが、使い切り設定を行わずに記録を開始させた場合は、ＤＳＰ３０の記録処理は図２１と同様の処理となる（Ｆ１０１～Ｆ１１８）。ところがユーザーが使い切り設定を行って記録動作を開始させた場合は、ＤＳＰ３０はステップＦ１１９，Ｆ１２０，Ｆ１２１の処理を行う。即ちステップＦ１１９からオーディオデータによるデータファイルの記録を開始する。データファイルはブロック単位で記録されていくことになる。

【０１３９】そして記録動作中は、ステップＦ１２０で、メモリカード４０における記録可能な残り容量が残り１ブロックになったか否かを監視している。またステップＦ１２１では、記録終了、即ちユーザの指示した１又は複数のデータファイルの記録が完了したか、或いはユーザーが操作部３９から記録停止操作を行ったことなどにより記録が終了されるものとなったか、を監視する。なお、記録中に供給されているオーディオデータとして、ファイルチェンジが検出された場合は、そのファイルチェンジポイントまでのオーディオデータが記録されたブロックで、１つのデータファイルが形成される。そして新たなデータファイルとして、続くオーディオデータを新たなブロックの先頭とした上で、その後の記録を行っていく。

【０１４０】ステップＦ１２０で肯定結果がでるより前に、ステップＦ１２１で記録終了となった場合は、ＤＳＰ３０はステップＦ１１８で、記録したコンテンツについての再生管理ファイルの作成（又は更新）を行って、記録処理を終える。この場合は、メモリカード４０における記録可能な容量は、その後の記録や編集のためには、まだ十分に残されている状態である。

【０１４１】ステップＦ１２０において、その時点で１ブロック数を残して、記録可能なブロックが使い切られてしまったと判断された場合は、ＤＳＰ３０はステップＦ１１７に進み、強制的に記録動作を停止する。そしてステップＦ１１８で、残りの１ブロックに対して、記録したコンテンツについての再生管理ファイルの作成（又は更新）を行って、記録処理を終える。この場合は、メモリカード４０における記録可能な容量が最大限、コンテンツの記録に用いられたことになる。つまりこの処理例２では、ユーザーの選択によって、もし記録後の編集を考えない場合であるなら、メモリカード４０の容量をコンテンツの記録に最大限利用できるようにするものである。

【０１４２】４－３　処理例３

図２３に処理例３を示す。この処理例は、余りブロックの設定を固定化したもので、また記録終了時点では、少なくとも固定値の余りブロックとしてのブロック数は、記録可能として確保されるようにした例である。

【０１４３】即ち記録が開始される際には、ＤＳＰ３０はステップＦ２０１で、或る設定された固定値としてｘクラスタ分を余りブロックとして設定する。そしてステップＦ２０２からオーディオデータによるデータファイルの記録を開始する。データファイルはブロック単位で

記録されていく。

【０１４４】そして記録動作中は、ステップＦ２０３で、メモリカード４０における記録可能な残り容量が、ｘ個の余りブロックを除いてゼロとなったか否かを監視し、またステップＦ２０４では、記録終了、即ちユーザの指示した１又は複数のデータファイルの記録が完了したか、或いはユーザーが操作部３９から記録停止操作を行ったことなどにより記録が終了されるものとなったか、を監視する。なお、記録中に供給されているオーディオデータとして、ファイルチェンジが検出された場合は、そのファイルチェンジポイントまでのオーディオデータが記録されたブロックで、１つのデータファイルが形成される。そして新たなデータファイルとして、続くオーディオデータを新たなブロックの先頭とした上で、その後の記録を行っていく。

【０１４５】ステップＦ２０３で肯定結果がでるより前に、ステップＦ２０４で記録終了となった場合は、ＤＳＰ３０はステップＦ２０６で、記録したコンテンツについての再生管理ファイルの作成（又は更新）を行って、記録処理を終える。この場合は、メモリカード４０における記録可能な容量は、その後の記録や編集のためには、まだ十分に残されている状態である。

【０１４６】ステップＦ２０３において、その時点でｘブロック数を残して、記録可能なブロックが使い切られてしまったと判断された場合は、ＤＳＰ３０はステップＦ２０５に進み、強制的に記録動作を停止する。そしてステップＦ２０６で、ｘブロックのうちの１ブロックを用いて、記録したコンテンツについての再生管理ファイルの作成（又は更新）を行って、記録処理を終える。この場合は、メモリカード４０における記録可能な容量として余りブロックとして設定された（ｘ－１）ブロック分だけ残された状態となる。

【０１４７】つまりこの処理例３では、記録終了時点で、少なくとも（ｘ－１）ブロック分の容量が残され、その分だけその後の編集が可能となる。固定的に設定されるｘの値としては、例えば統計的に妥当と考えられる値としてもよいし、例えばユーザーが任意に設定できるようにして、ユーザーの事情や記録内容に合致した処理が行われるようにすることもできる。

【０１４８】以上、本発明の実施の形態としての例を説明してきたが、実施の形態の例はあくまでも一例であり、レコーダの構成、処理方式などは、多様に考えられる。特に余りブロック数の設定方式は、各種の多様な変形例が考えられる。また上記例ではオーディオデータとしてのコンテンツ（プログラム）を想定して説明したが、ビデオデータとしてのコンテンツについても、全く同様に本発明を適用できる。テキストデータその他のコンテンツについても同様である。

【０１４９】

【発明の効果】以上の説明から分かるように本発明では、記録動作に際して所要量の余りブロック量を設定するとともに、プログラム記録動作により、記録媒体上で、余りブロック量を除いた記録可能なブロック残量がゼロとなったら、プログラム記録動作を終了させるようにしているため、プログラム（コンテンツ）の記録終了後において、少なくとも上記余りブロック量に相当する記録可能容量が残されるものとなる。そして管理情報の記録又は更新、及び／又は記録されたプログラムの編集に用いられるブロックとして、余りブロック量が設定されていることで、プログラムの記録を完結させるための管理情報の書込／更新、或いはその後のプログラムの編集のために用いる領域が確保されていることになり、つまり記録や編集が適切に実行できる状態を確保できるという効果がある。また、余りブロック量は、プログラム記録手段による記録動作の際に、記録媒体上に記録されているプログラム数に応じて設定すること、或いは記録媒体上に記録されているプログラムの平均データサイズと記録媒体の容量に応じて設定することで、その記録媒体のプログラム記録状況に合致した適切な量とすることができ、余りブロック量が多すぎてむやみにプログラム記録領域が削減されたり、或いは逆に、その後の編集等のために十分なブロック量が確保できないということを避けられる。

【０１５０】また記録媒体において記録可能なブロック残量が所定以下となったら、その記録媒体に記録されているプログラムについての編集処理が不可とされることの警告を出力することで、ユーザーに状況を告知できる。

【０１５１】また記録媒体上で前記余りブロック量を除いた記録可能なブロック残量がゼロとなったらプログラム記録動作を終了させる動作モードと、記録媒体上で記録可能なブロック残量がゼロとなるまでプログラム記録動作を続行可能とする動作モードとを選択できるようにすることで、ユーザーの事情に応じて、記録媒体の記録容量を有効に利用できるようにすることができる。

【図面の簡単な説明】

【図１】本発明の実施の形態のレコーダのブロック図である。

【図２】実施の形態のレコーダのＤＳＰのブロック図である。

【図３】実施の形態のメモリカードの構成を示すブロック図である。

【図４】実施の形態におけるメモリカードのファイルシステム処理階層の構成の説明図である。

【図５】実施の形態のメモリカードのデータの物理的構成のフォーマットの説明図である。

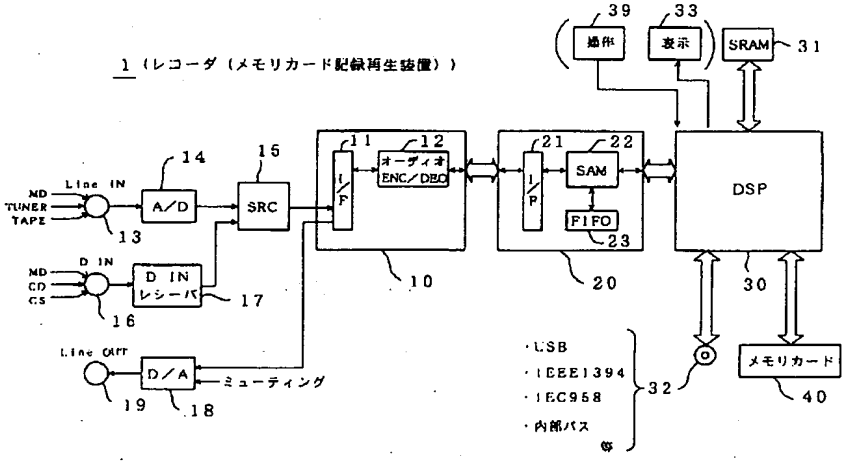
【図６】実施の形態のメモリカードのディレクトリ構造の説明図である。

【図７】実施の形態のメモリカードの再生管理ファイルのデータ構成の説明図である。

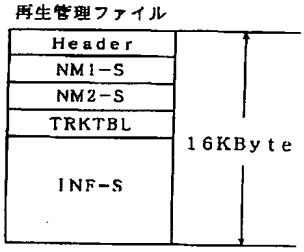
【図８】実施の形態のメモリカードのデータファイルのデータ構成の説明図である。
【図９】実施の形態のデータファイルの構成の説明図である。
【図１０】実施の形態のデータファイルのコンバイン編集処理の説明図である。
【図１１】実施の形態のデータファイルのデバイド編集処理の説明図である。
【図１２】実施の形態の再生管理ファイルの構成の説明図である。
【図１３】実施の形態の再生管理ファイルの付加情報領域の構成の説明図である。
【図１４】実施の形態の付加情報キーコードの説明図である。
【図１５】実施の形態の付加情報キーコードの説明図である。
【図１６】実施の形態の付加情報キーコードの説明図である。
【図１７】実施の形態における付加情報の具体的なデータ構成の説明図である。
【図１８】実施の形態のデータファイルの構成の説明図である。
【図１９】実施の形態のデータファイルの属性ヘッダの「Ａ」の説明図である。
【図２０】実施の形態のデータファイルの属性ヘッダの「ＣＣ」の説明図である。
【図２１】実施の形態の記録処理のフローチャートである。
【図２２】実施の形態の記録処理のフローチャートである。
【図２３】実施の形態の記録処理のフローチャートである。

【符号の説明】
１，１Ａ，１Ｂ　レコーダ、１０　オーディオエンコーダ／デコーダＩＣ、２０　セキュリティＩＣ、３０　ＤＳＰ、４０　メモリカード、４２　フラッシュメモリ、５２　セキュリティブロック

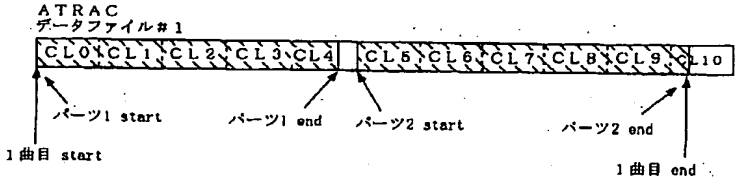
【図１】



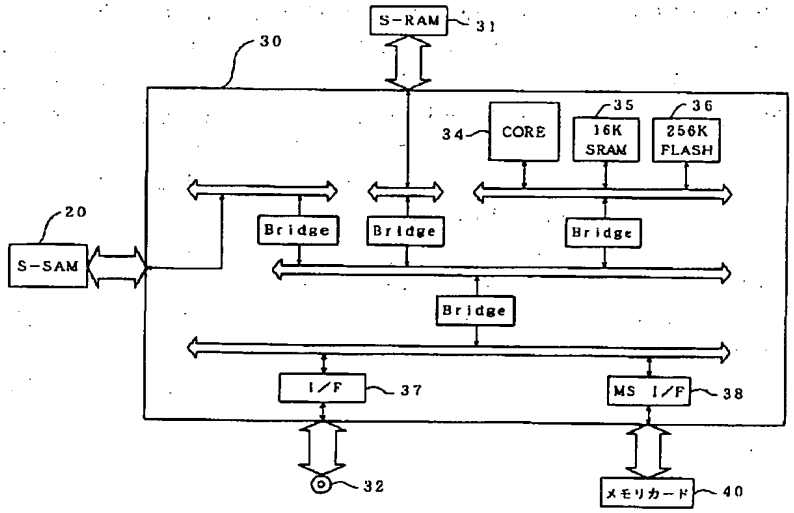
【図７】



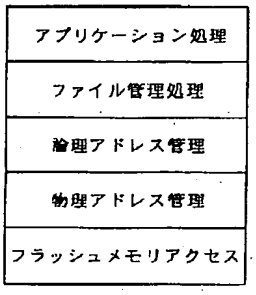
【図１０】



【図２】

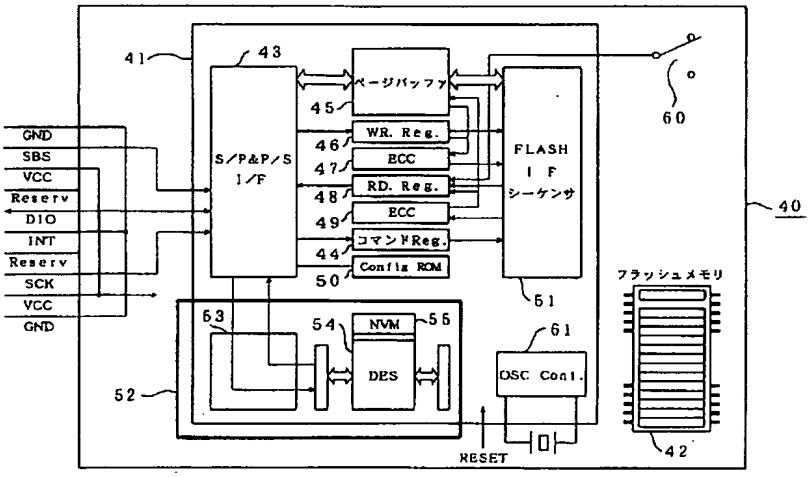


【図４】

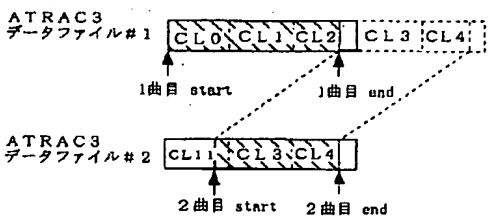


ファイルシステム処理階層

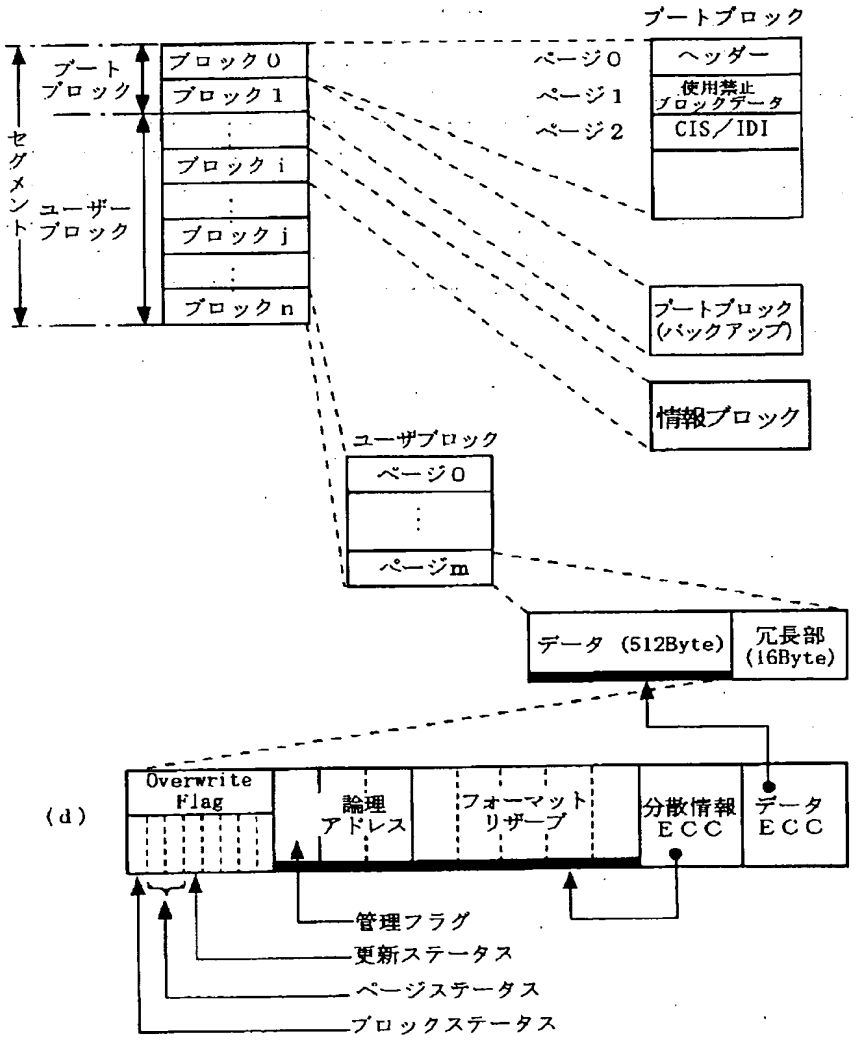
【図３】



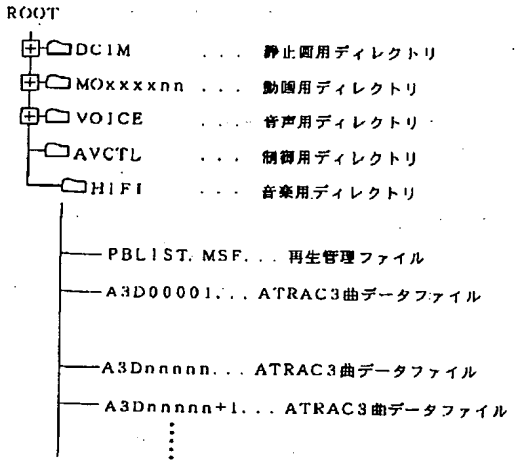
【図１１】



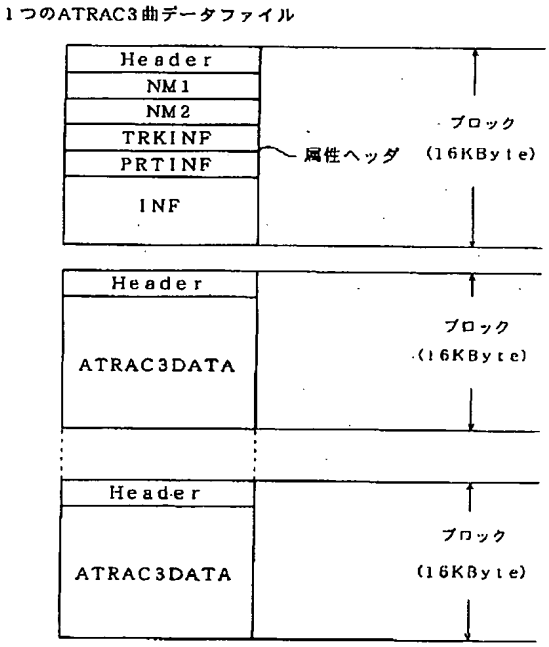
【図５】


ブートブロック
ページ０
ページ１
ページ２
ヘッダー
使用禁止ブロックデータ
CIS／IDI
ブート
ブロック
セグメント
ユーザー
ブロック
ブロック０
ブロック１
ブロックｉ
ブロックｊ
ブロックｎ
ブートブロック
(バックアップ)
情報ブロック
ユーザブロック
ページ０
ページｍ
データ (512Byte)
冗長部
(16Byte)
(d)
Overwrite
Flag
論理
アドレス
フォーマット
リザーブ
分散情報
ＥＣＣ
データ
ＥＣＣ
管理フラグ
更新ステータス
ページステータス
ブロックステータス

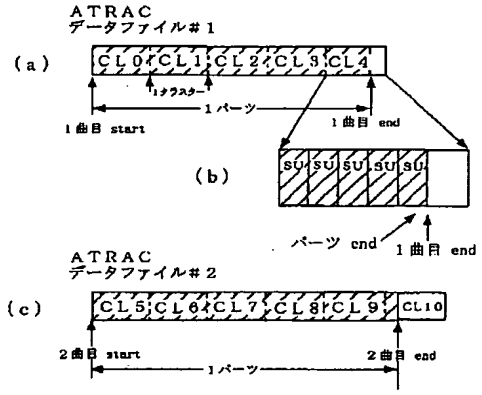
【図６】



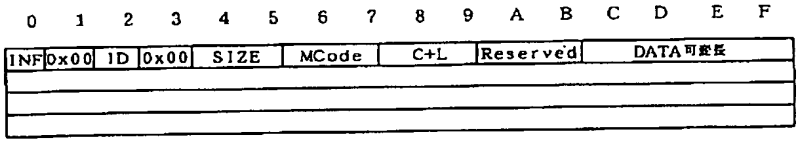
【図８】



【図９】

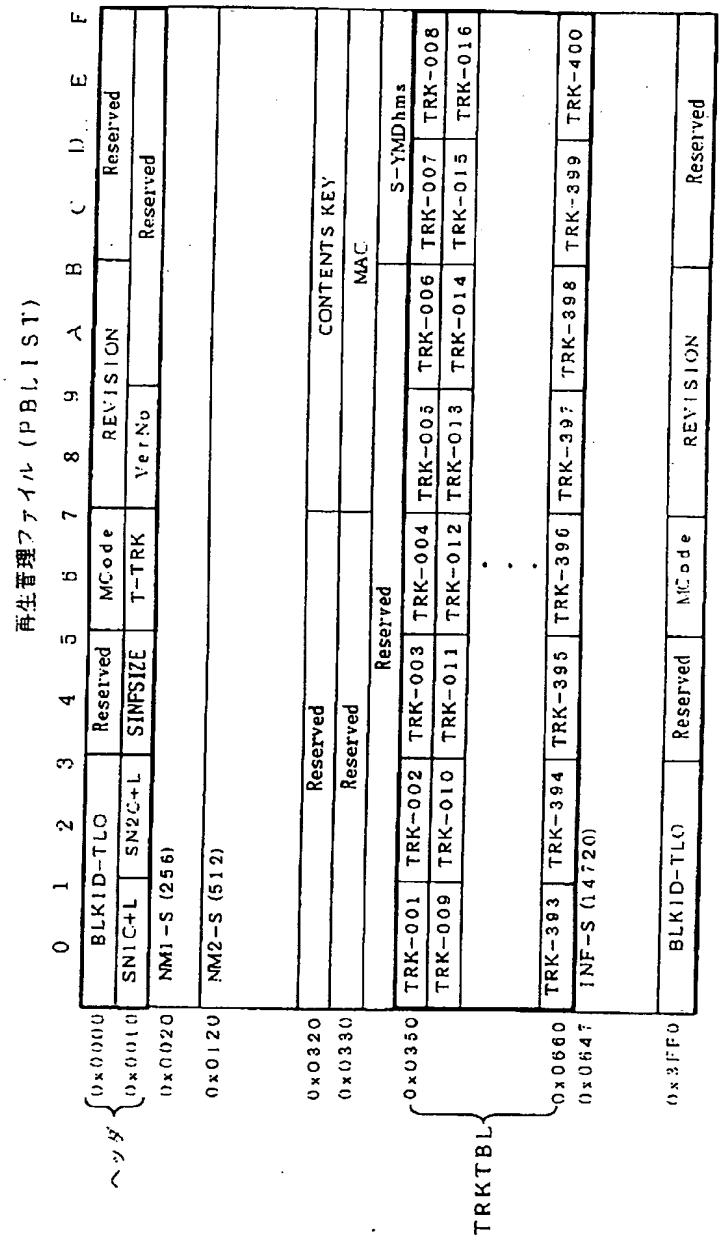


【図１３】



付加情報データ（INF－S）

【図１２】


再生管理ファイル（ＰＢＬＩＳＴ）
0 1 2 3 4 5 6 7 8 9 A B C D E F
ヘッダ
TRKTBL
BLKID-TLO
Reserved
MCode
REVISION
Reserved
SN1C+L
SN2C+L
SINFSIZE
T-TRK
VerNo
Reserved
NM1-S (256)
NM2-S (512)
Reserved
CONTENTS KEY
Reserved
MAC
Reserved
S-YMDhms
TRK-001
TRK-002
TRK-003
TRK-004
TRK-005
TRK-006
TRK-007
TRK-008
TRK-009
TRK-010
TRK-011
TRK-012
TRK-013
TRK-014
TRK-015
TRK-016
TRK-393
TRK-394
TRK-395
TRK-396
TRK-397
TRK-398
TRK-399
TRK-400
INF-S (14720)
BLKID-TLO
Reserved
MCode
REVISION
Reserved
0x0000
0x0010
0x0020
0x0120
0x0320
0x0330
0x0350
0x0660
0x0670
0x3FF0

【図１４】

付加情報キーコード

ID	音楽関係（文字）		ID	URL（Web関係）	
0	reserved		32	reserved	
1	アルバム	可変	33	アルバム	可変
2	サブタイトル	可変	34	サブタイトル	可変
3	アーティスト	可変	35	アーティスト	可変
4	指揮者	可変	36	指揮者	可変
5	オーケストラ	可変	37	オーケストラ	可変
6	プロデューサ	可変	38	プロデューサ	可変
7	発行・出版社	可変	39	発行・出版社	可変
8	作曲者	可変	40	作曲者	可変
9	作詞者	可変	41	作詞者	可変
10	編曲者	可変	42	編曲者	可変
11	スポンサー	可変	43	スポンサー	可変
12	CM	可変	44	CM	可変
13	解説	可変	45	解説	可変
14	原曲名	可変	46	原曲名	可変
15	原曲アルバム名	可変	47	原曲アルバム名	可変
16	原曲作曲者	可変	48	原曲作曲者	可変
17	原曲作詞者	可変	49	原曲作詞者	可変
18	原曲編曲者	可変	50	原曲編曲者	可変
19	原曲演奏者	可変	51	原曲演奏者	可変
20	メッセージ	可変	52		
21	コメント	可変	53		
22	警告	可変	54		
23	ジャンル	可変	55		
24	文章	可変	56		
25			57		
26			58		
27			59		
28			60		
29			61		
30			62		
31			63		

【図１５】

付加情報キーコード

ID	パス／その他		ID	制御／数値データ関係	
64	Reserved		96	Reserved	
65	画像データへのパス	可変	97	ISRC	8
66	歌詞データへのパス	可変	98	TOC_ID	8
67	MIDIデータへのパス	可変	99	UPC／JAN	7
68	解説データへのパス	可変	100	収録日（YMDhms）	4
69	コメントデータへのパス	可変	101	発売日（YMDhms）	4
70	CMデータへのパス	可変	102	原曲発売日（YMDhms）	4
71	FAXデータへのパス	可変	103	録音日時（YMDhms）	4
72	通信データ1へのパス	可変	104	サブトラック	4
73	通信データ2へのパス	可変	105	平均音量	1
74	制御データへのパス	可変	106	レジューム	4
75			107	再生ログ（YMDhms）	4
76			108	再生回数（半固定）	1
77			109	PASSWORD1	16
78			110	APPLevel	16
79			111	ジャンルコード	2
80			112	MIDIデータ	可変
81	パーツ付加情報	可変	113	サムネール写真データ	可変
82			114	文字放送データ	可変
83			115	総曲数	2
84			116	セット番号	1
85			117	総セット番号	1
86			118	REC位置情報−GPS	可変
87			119	PB 位置情報−GPS	可変
88			120	REC位置情報−PHS	可変
89			121	PB 位置情報−PHS	可変
90	DISC−TOC	可変	122	接続先電話番号1	可変
91			123	接続先電話番号2	可変
92			124	入力値	可変
93			125	出力値	可変
94			126	PB制御データ	可変
95			127	REC制御データ	可変

【図１９】

A

bit	意味	値
7	ATRAC3のモード	0：Dual　　1：Joint
6 5 4	レートの値	N　表示　Time　Rate　SU　Byte 7　HQ　47min　176kbps　31SU　512 6　EX　58min　146kbps　38SU　424 5　EX　64min　132kbps　42SU　384 4　SP　81min　105kbps　53SU　304 3　LP　90min　94kbps　69SU　272 2　LP　128min　66kbps　84SU　192 1　MN　181min　47kbps　119SU　136 0　MN　258min　33kbps　169SU　96 （Nはbit6，5，4の3ビットの値） ＊N＝0，1のモノラルは、bit7が「1」（Joint）で、メイン信号のみの特別なJointモードをモノラルとして規定する
3	Reserved	−
2	データ区分	0：オーディオ　　1：その他
1	再生SKIP	0：通常再生　　1：SKIP
0	エンファシス	0：OFF　　1：ON（50／15μs）

【図１６】

付加情報キーコード

ID	同期再生関係	
128	reserved	
129	同期再生関係１	可変
130	同期再生関係２	可変
131	同期再生関係３	可変
132	同期再生関係４	可変
133	同期再生関係５	可変
134	同期再生関係６	可変
135		
136		
137		
138	ＥＭＤ関連１	可変
139	ＥＭＤ関連２	可変
140		
141		
142		
143		
144		
145		
146		
147		
148		
149		
150		
151		
152		
153		
154		
155		
156		
157		
158		
159		

【図２０】

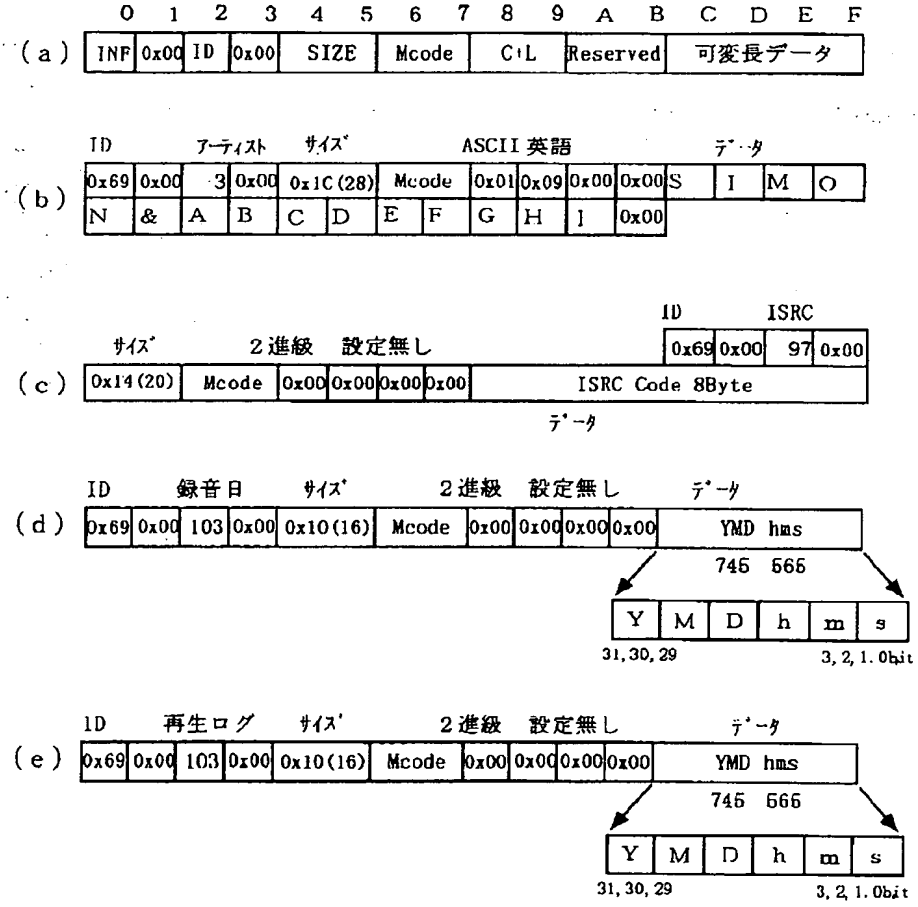
CC

bit	意味	値
7	コピー制御　コピー可否	0：コピー禁止　1：コピー可
6	コピー制御　世代	0：オリジナル　1：第１世代以上
5 4	高速デジタル コピー制御 (HCMS)	00：コピー禁止　01：コピー第１世代 10：コピー可
3	コピー属性	000：Reserved
2		001：オリジナルソースから記録したコンテンツ
		010：ＬＣＭからコピーしたコンテンツ
1		011：ＬＣＭからムーブしたコンテンツ
		100以上：Reserved
0	Reserved	－

LCM：Licensed Compliant Module

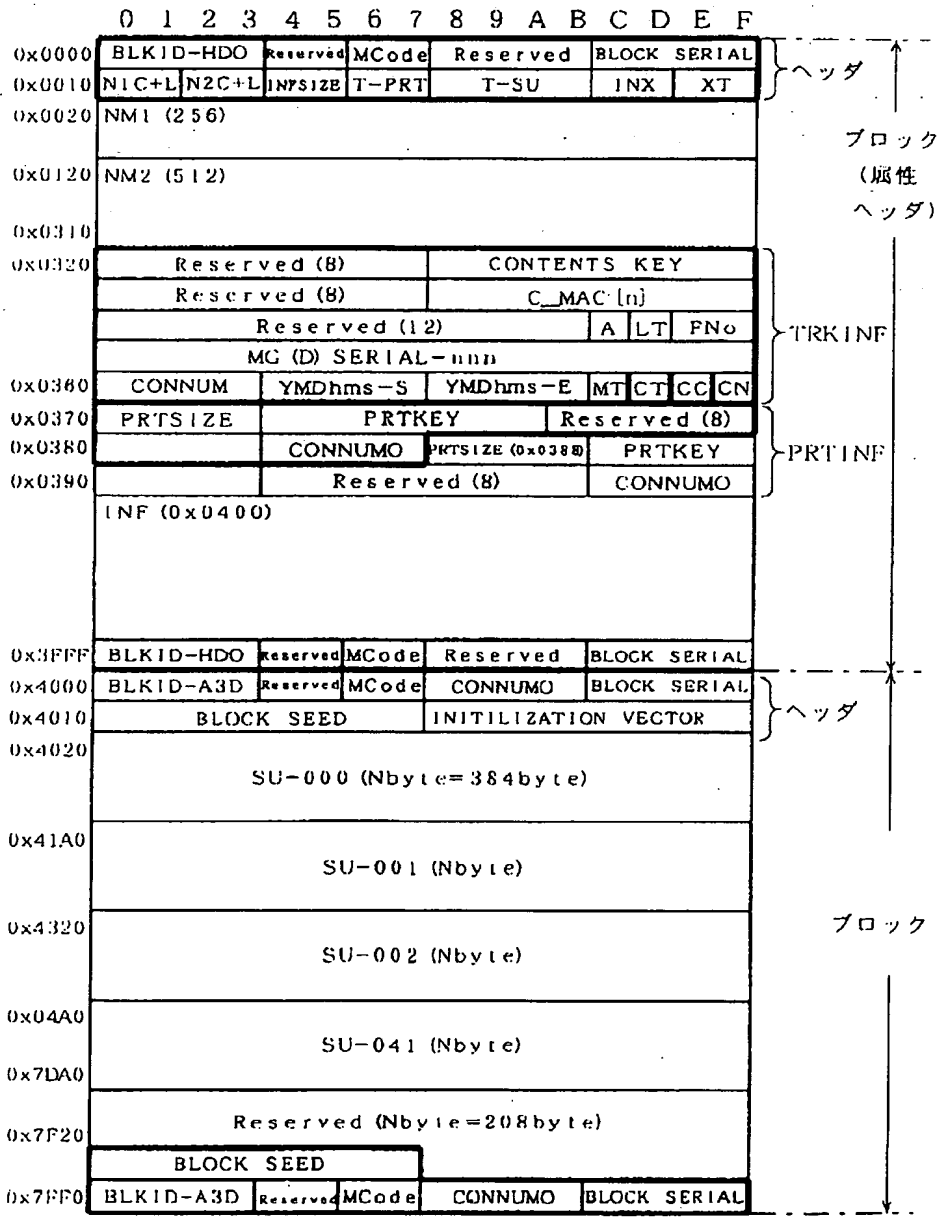
例：ＰＣやコンシューマ機器のＨＤＤ等

【図１７】

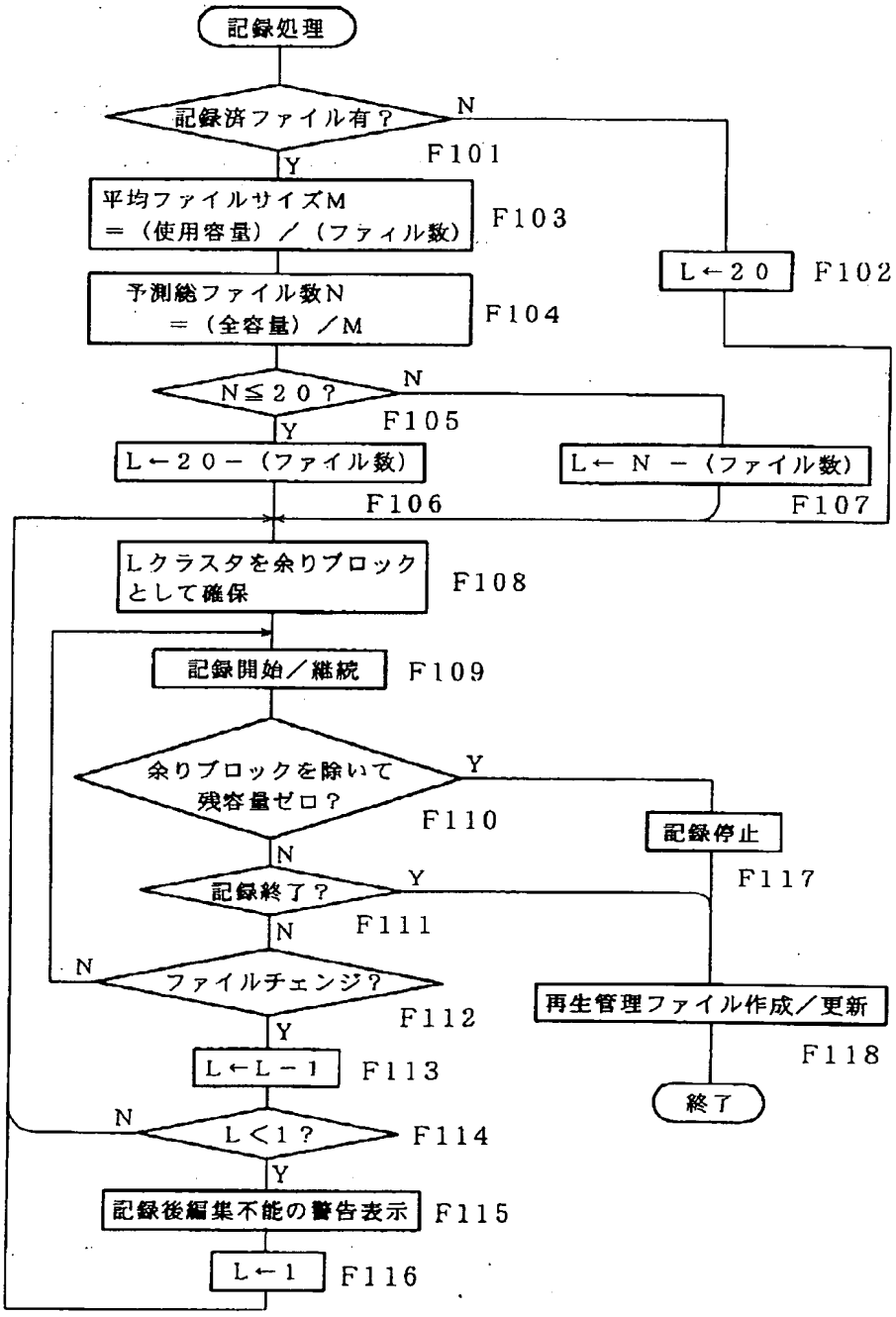

0 1 2 3 4 5 6 7 8 9 A B C D E F
(a)
INF 0x00 ID 0x00 SIZE Mcode CTL Reserved 可変長データ
ID アーティスト サイズ ASCII 英語 データ
(b)
0x69 0x00 3 0x00 0x1C(28) Mcode 0x01 0x09 0x00 0x00 S I M O
N & A B C D E F G H I 0x00
ID ISRC
サイズ 2進級 設定無し
(c)
0x69 0x00 97 0x00
0x14(20) Mcode 0x00 0x00 0x00 0x00 ISRC Code 8Byte
データ
ID 録音日 サイズ 2進級 設定無し データ
(d)
0x69 0x00 103 0x00 0x10(16) Mcode 0x00 0x00 0x00 0x00 YMD hms
745 666
Y M D h m s
31, 30, 29
3, 2, 1. 0bit
ID 再生ログ サイズ 2進級 設定無し データ
(e)
0x69 0x00 103 0x00 0x10(16) Mcode 0x00 0x00 0x00 0x00 YMD hms
745 666
Y M D h m s
31, 30, 29
3, 2, 1. 0bit

【図１８】

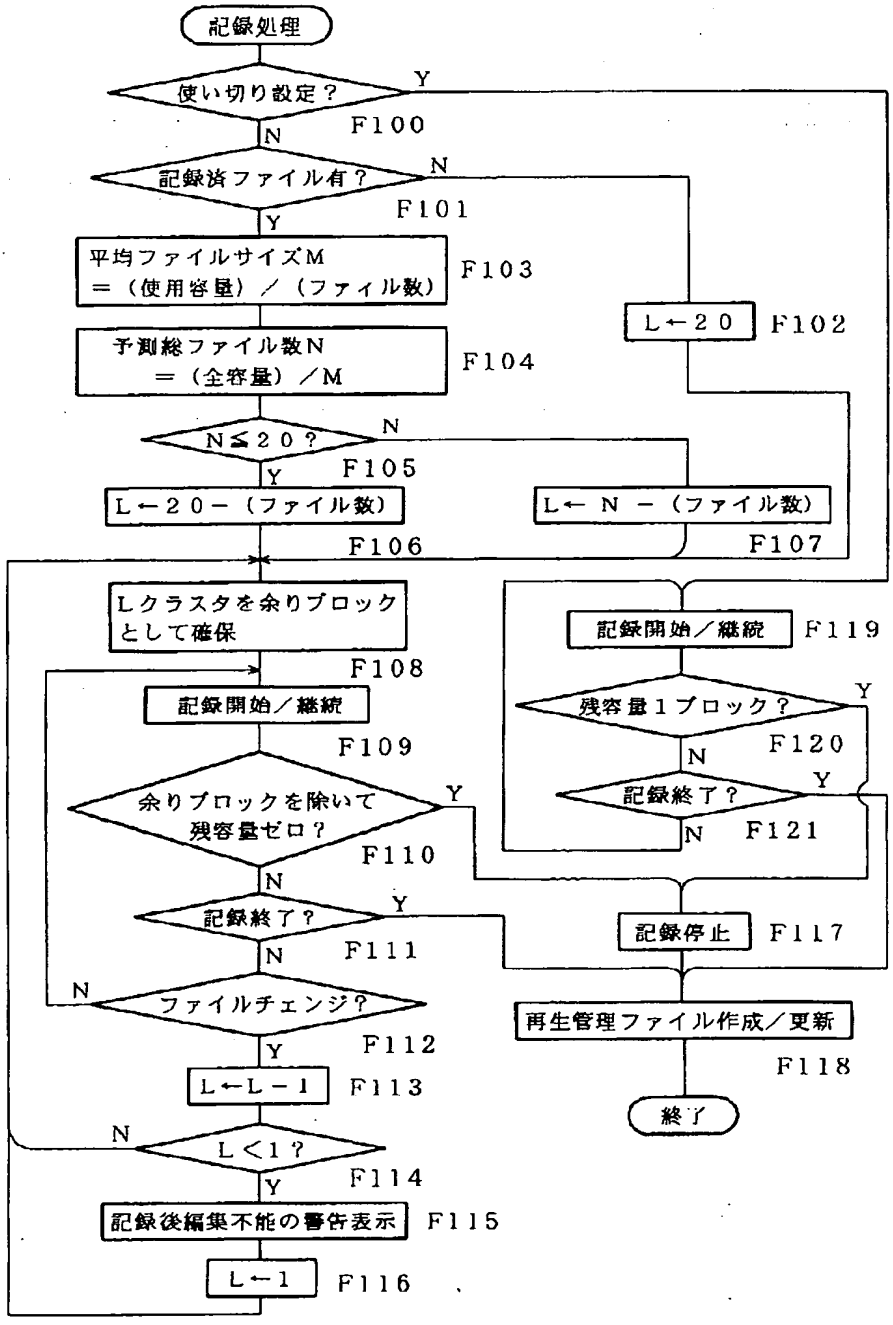
A3Dnnnnn. MSA (ATRAC3データファイル)



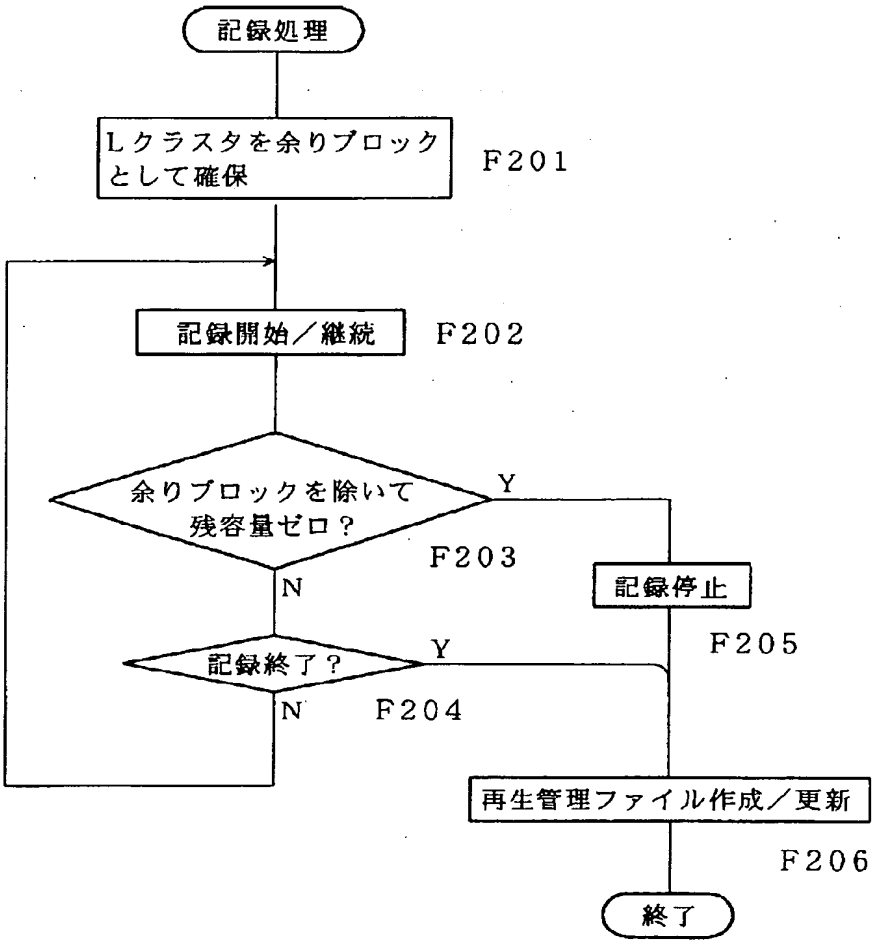
【図２１】


記録処理
記録済ファイル有？
N
Y
F101
平均ファイルサイズM
＝（使用容量）／（ファイル数）
F103
予測総ファイル数N
＝（全容量）／M
F104
L←２０
F102
N≦２０？
N
Y
F105
L←２０－（ファイル数）
L← N －（ファイル数）
F106
F107
Lクラスタを余りブロック
として確保
F108
記録開始／継続
F109
余りブロックを除いて
残容量ゼロ？
Y
F110
記録停止
N
記録終了？
Y
F117
N
F111
N
ファイルチェンジ？
F112
再生管理ファイル作成／更新
Y
L←L－１
F113
F118
終了
N
L＜１？
F114
Y
記録後編集不能の警告表示
F115
L←１
F116

【図２２】


記録処理
使い切り設定？
Y
F100
N
記録済ファイル有？
N
F101
Y
平均ファイルサイズM
＝（使用容量）／（ファイル数）
F103
L←２０
F102
予測総ファイル数N
＝（全容量）／M
F104
N≦２０？
N
F105
Y
L←２０－（ファイル数）
L← N －（ファイル数）
F106
F107
Lクラスタを余りブロック
として確保
F108
記録開始／継続
F109
余りブロックを除いて
残容量ゼロ？
Y
F110
N
記録終了？
Y
F111
N
ファイルチェンジ？
N
F112
Y
L←L－１
F113
L＜１？
N
F114
Y
記録後編集不能の警告表示
F115
L←１
F116
記録開始／継続
F119
残容量１ブロック？
Y
F120
N
記録終了？
Y
F121
N
記録停止
F117
再生管理ファイル作成／更新
F118
終了

【図２３】


記録処理
Lクラスタを余りブロックとして確保
F201
記録開始／継続
F202
余りブロックを除いて残容量ゼロ？
F203
Y
N
記録停止
F205
記録終了？
Y
N
F204
再生管理ファイル作成／更新
F206
終了